

## 5. CUMULATIVE IMPACTS

CEQ regulations require an assessment of potential cumulative impacts. Cumulative impact is defined by those regulations at 40 CFR 1508.7 as:

*the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

Cumulative impacts for each affected resource are assessed in this section. The discussion of potential cumulative impacts assumes the successful implementation of the environmental protection and mitigation measures described in **Appendix C** and **Chapter 4** of this EIS, as well as compliance with the Rawlins RMP and all applicable federal, state, and local regulations and permit requirements, including reclamation requirements. The analysis of cumulative impacts addresses both potentially adverse and beneficial impacts.

The cumulative impact analysis area (CIAA) for the CD-C project generally includes south-central Wyoming but is variable for each resource. No single geographic unit would serve as a CIAA for all resources. The Air Quality analysis, for example, analyzes cumulative impacts over an area that includes all of southwestern Wyoming and parts of Colorado, Utah, and Idaho. The Geology cumulative analysis, on the other hand, is concerned only with the CD-C project area itself. For the cumulative analysis in this EIS, each resource analysis includes a definition of the area considered in its cumulative impact analysis.

The cumulative impact analysis has an estimated future timeframe of 45 to 55 years—the 15-year period of development plus the 30- to 40-year operational life of a producing well. As with the impact analysis area, the time frame for cumulative impact analysis will vary from one resource to another.

The “past, present, and reasonably foreseeable future actions” most commonly associated with the CD-C project area and south central Wyoming in general are grazing, transportation, and natural gas development. Livestock grazing—both sheep and cattle—began in the 1870s, continues today, and is expected to continue into the future. Sheep numbers have declined from their peak in the early part of the 20th century but cattle numbers remain high.

The area has been traversed by trails since humans first came to the area, and today includes major east-west and north-south transportation and utility corridors used for roads, railroads, and pipelines. The Overland and the Cherokee Trails—historic passageways—cross the area. The first transcontinental railroad, the Union Pacific, came to the area in the 1860s and still operates today, with heavy freight traffic crossing east and west. The nation’s first transcontinental highway, the Lincoln Highway, was built in the same corridor as the railroad in the early part of the 20th century. It has been replaced by I-80, which will remain a major east-west transportation route into the future. Wyoming State Highway 789 (WY 789) and several county roads are the main north-south routes in the area. The Wamsutter Hub is a major connection point for the many natural gas pipelines that traverse the area east-west and north-south.

Natural gas exploration and development in the CD-C project area and the surrounding area has been ongoing since the 1940s. The Wamsutter field, the first natural gas field in the area, was established in 1958. Since then, the rate of development has varied but has proceeded at the rate of about 200 wells per year since 2008. Prior development and existing activities within the project area are described in the introduction to Chapter 4, Environmental Consequences (**Section 4.0.1**). The 47,200 acres of new surface disturbance associated with the Proposed Action of the CD-C Natural Gas Development Project would be added to 60,176 acres of surface disturbance that has already occurred within the area. The CD-C project

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impacts for each of the resources and activities discussed in Chapter 4 are described in the context of those disturbances and impacts that have already occurred in the project area. Those discussions will not be repeated here. There are other defined areas in south-central Wyoming—the Atlantic Rim and the Hiawatha project areas, for example—where natural gas has historically been produced and will continue to be produced. Those will be discussed in this section to the extent that they are relevant. **Table 5.0-1** presents the Reasonably Foreseeable Future Actions (RFFAs) for the CD-C project cumulative analysis, including the principal natural gas projects, wind energy developments, mining activity, electrical transmission lines, and industrial development projects that are ongoing or that are in planning. **Map 5.0-1** shows the locations of the projects listed on Table 5.0-1.

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**Table 5.0-1. Ongoing and Reasonably Foreseeable Future Actions (RFFAs)**

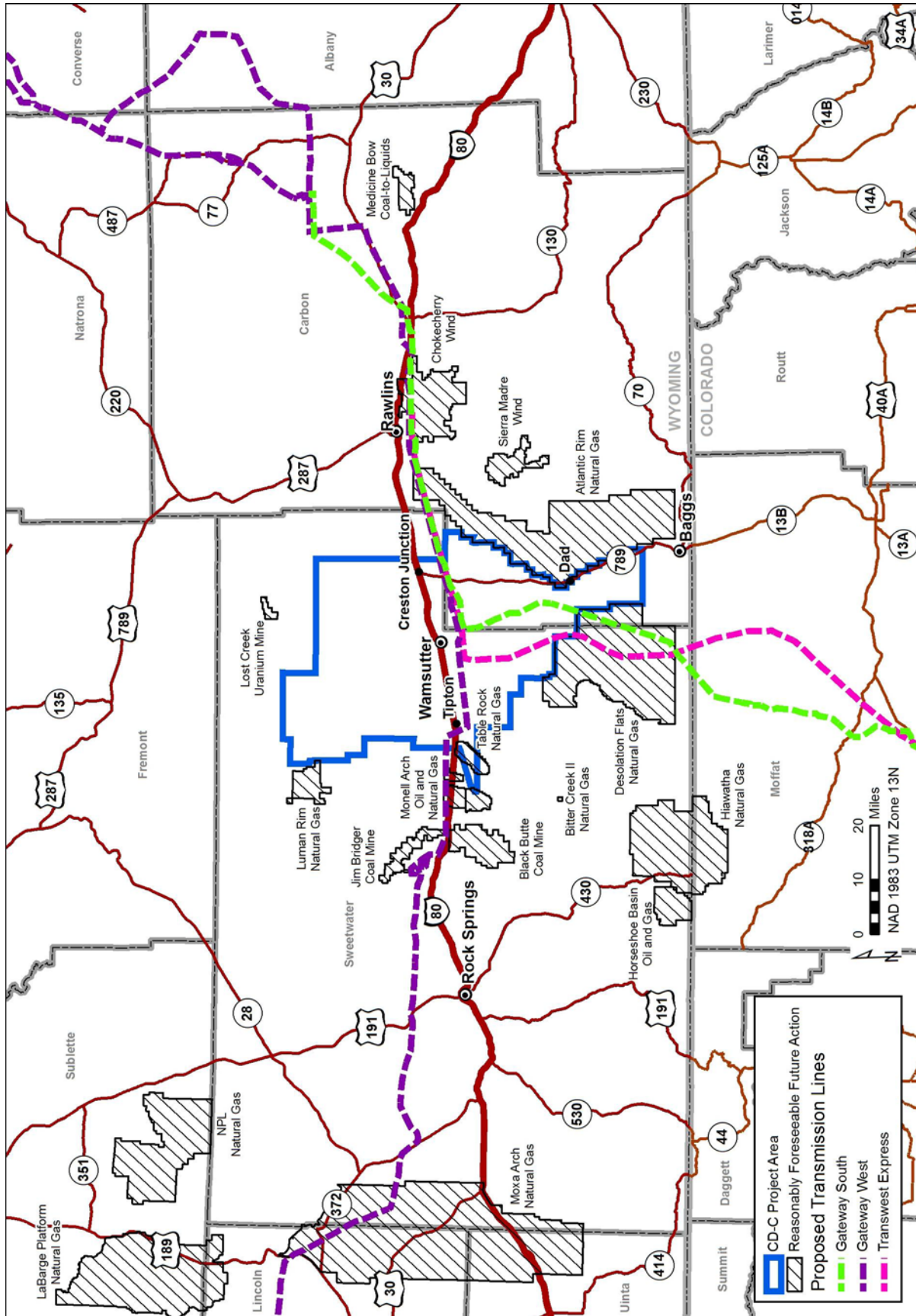
Project	Proponent	Location	County	Development Schedule	Scale
<b><i>Natural Gas and Oil</i></b>					
Atlantic Rim Natural Gas Field Development	Warren Resources and Double Eagle Petroleum Company	East of and adjacent to CD-C project area	Carbon	2007–2027	2,000 wells/ 270,080 acres
Bitter Creek Shallow Oil and Gas Project	Infinity/Yates Petroleum	30 miles east of Rock Springs	Sweetwater	2005–2009	61 wells/ 17,961 acres
Desolation Flats Natural Gas Development Project	Marathon Oil and others	Southwest of and adjacent to CD-C project area	Sweetwater/Carbon	2004–2024	385 wells/ 233,542 acres
Hiawatha Regional Energy Development Project	Questar/Wexpro	65 miles southeast of Rock Springs	Sweetwater/Moffat CO	2016–2046	2,200 wells/ 157,361 acres
LaBarge Platform Exploration and Development Project	EOG Resources, Inc. and others.	65 miles northwest of Rock Springs	Lincoln/ Sublette	2016–2026	838 wells/ 218,000 acres
Luman Rim Natural Gas Project	Yates Petroleum and others	Northwest of and adjacent to CD-C project area	Sweetwater	2011–2021	58 wells/ 19,548 acres
Moxa Arch Area Infill Gas Development Project	BP America and others	Northeast of Fort Bridger	Uinta/Lincoln/ Sweetwater	Unknown	1,860 wells/ 476,300 acres
Normally Pressured Lance (NPL) Natural Gas Development Project	EnCana and others	Immediately southwest of the Jonah Field	Sublette	2016–2026	3,500 wells/ 141,080 acres
Horseshoe Basin Oil and Gas Project	Devon	55 miles SE of Rock Springs	Sweetwater	2014–2024	20 wells/ 24,972 acres
Table Rock Unit Oil and Gas Development	Chevron U.S.A.	40 miles east of Rock Springs (partly in CD-C)	Sweetwater	2013–2027	88 wells/ 13,633 acres
Monell Arch Oil and Gas Development Project	Anadarko	Immediately West of CD-C in Patrick Draw	Sweetwater	2013-2022	125 wells/ 22,657 acres

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**Table 5.0-1. Ongoing and Reasonably Foreseeable Future Actions (RFFAs), *continued***

<b>Wind Energy</b>					
Chokecherry-Sierra Madre Wind Energy Project	Power Company of Wyoming	South of Rawlins	Carbon	2012–2015	1,000 turbines/ 215,000 acres
<b>Transmission Lines</b>					
Gateway West Transmission Line Project	Idaho Power and Rocky Mountain Power Companies	Glenrock, Wyoming to Melba, Idaho	Converse/ Albany/ Carbon/ Sweetwater and west	2014–2018	~500 miles
Gateway South Transmission Line Project	Rocky Mountain Power Company	Medicine Bow, Wyoming to Mona, Utah	Converse/ Albany/ Carbon/ and southwest	2017–2020	~400 miles/250' ROW
TransWest Express Transmission Line Project	TransWest Express LLC	Sinclair, Wyoming to southern Nevada	Carbon and southwest	2014–2017	~600 miles/250' ROW
<b>Mining</b>					
Lost Creek In-Situ Uranium Project	UR Energy (Lost Creek ISR LLC)	15 miles southwest of Bairoil	Sweetwater	2011-2024	4,250 acres
Jim Bridger Coal Mine	Idaho Energy Resource Company/Pacific Minerals	25 miles east of Rock Springs	Sweetwater	2011–2031	6 million tons/year
Black Butte Coal Mine	Black Butte Coal Company	25 miles east of Rock Springs	Sweetwater	2007–2027	2.2 million tons/year
<b>Other</b>					
Medicine Bow Fuel & Power Coal-to-Liquids Project	Medicine Bow Fuel & Power	South of Medicine Bow	Carbon	Unknown	20,000 bbl/day





Map 5.0-1. Ongoing and Reasonably Foreseeable Future Actions

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

## ■ PHYSICAL ENVIRONMENT

### 5.1 GEOLOGY

The CIAA for geology is the CD-C project area. Geologic resources are not expected to be impacted by activities that occur outside the project area nor would implementation of CD-C project activities have impact outside the area. Cumulative impacts would be limited to past and ongoing oil and gas extraction, grazing, and transportation activities within the project area. Geological resources have not been significantly affected by past and continuing activities in the project area and are not expected to be notably affected by any future activities if mitigation measures described in **Appendix C** are implemented.

### 5.2 PALEONTOLOGIC RESOURCES

The CIAA for paleontology is the CD-C project area. Paleontological resources within the project area are not expected to be impacted by activities that occur outside the project area and resources outside the project area would not be affected by CD-C project activities. Cumulative impacts would be limited to other surface-disturbing activities—past and ongoing oil and gas extraction, grazing, transportation activities, and electric transmission lines constructed within the project area. Paleontological resources have not been significantly affected by past and continuing activities in the project area and are not expected to be notably affected by any future activities if mitigation measures described in **Appendix C** and **Section 4.2.5, Unavoidable Adverse Impacts and Additional Mitigation Measures**, are implemented.

### 5.3 SOILS

The CIAA for soils is the CD-C project area. Project area soils would not be impacted by activities that occur outside the project area nor would implementation of CD-C project activities have soil impacts outside the area. Cumulative impacts would include the past, ongoing, and future removal of vegetation and soil, exposure of soil, soil compaction, and undesirable mixing of soil horizons. Cumulative activities that have occurred or are likely to occur in the CIAA are past and ongoing oil and gas drilling and production, grazing, and transportation activities. Past and ongoing activities would continue to increase soil disturbances and decrease soil productivity for the lifetime of those activities, until final reclamation for oil and gas development and for an indeterminate period for grazing and transportation activities. The CD-C project represents all of the natural gas development in the CIAA for the foreseeable future, the 45-55 year life of the project. Cumulative losses for soil resources and soil productivity would occur due to 43,808 acres of new surface disturbance under Alternative F (Agency Preferred Alternative). Past surface disturbance related to natural gas development totals 49,218 acres (**Table 4.0-1**). Other activities—primarily construction of roads and ranching-related facilities—added 10,958 acres, for an estimated historical soil disturbance of 60,176 acres. Together with CD-C project-related disturbance, an estimated combined 103,984 acres would be disturbed, representing 9.7 percent of the surface of the project area.

Post-reclamation disturbances for Alternative F would be relatively low and successful reclamation would reduce the cumulative impacts to the soil resource. Impacts to soil productivity, vegetation, and surface water would be more severe during development and production, and would diminish during final reclamation and the post-reclamation phase of the project. Implementation of BMPs to reduce erosion and sedimentation and promote revegetation would be used to reduce cumulative impacts.

The proposed Gateway West, Gateway South, and TransWest Express transmission-line projects would cross the CIAA and would have the potential to affect soils during construction, operation, and decommissioning of the projects. These projects include mitigation measures and BMPs that would

reduce soil impacts to minimal levels. The disturbance to the CIAA from these projects would be negligible.

#### 5.4 WATER RESOURCES

The CIAA for water resources includes two components: (1) an analysis of cumulative impacts within the CD-C project area and (2) an analysis of cumulative impacts on portions of the watersheds that are associated with the CD-C project area. **Map 5.4-1** depicts the watersheds within the CIAA. The cumulative surface water impacts analysis area includes portions of the White-Yampa, Great Divide, and the Upper Green drainage basins. The cumulative groundwater impact analysis area includes portions of the Green River, Great Divide, and Washakie structural basins, the Rock Springs and Rawlins uplifts, and the Wamsutter Arch. Cumulative impacts include water resource impacts from past, present, and reasonably foreseeable future oil and gas developments, the Chokecherry-Sierra Madre Wind Energy Project (CCSM), agriculture (irrigated crops, livestock grazing, and ranch management), recreational activities/vehicular traffic, and other mining and industrial activities.

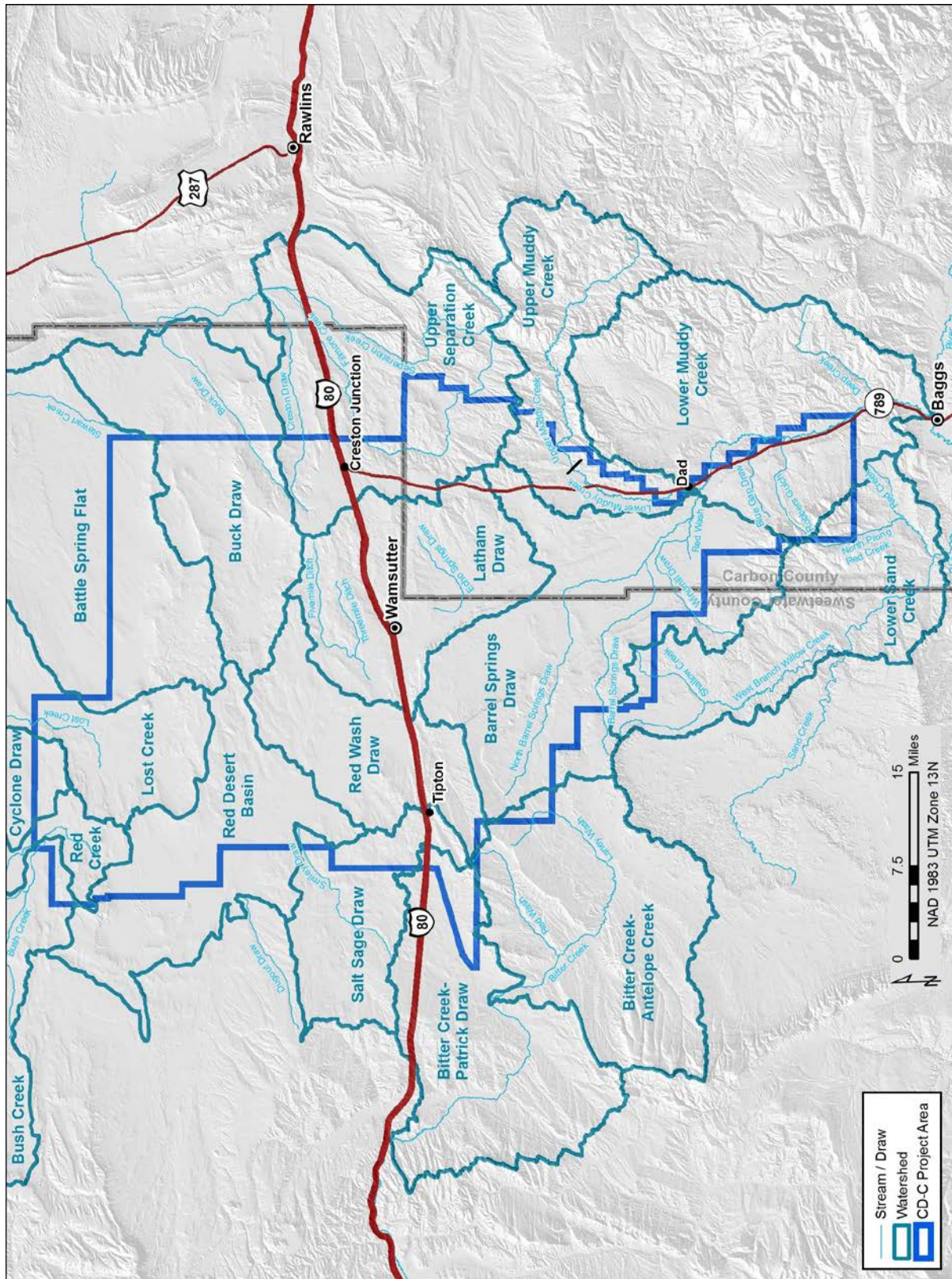
The southern portion of the project area is primarily drained by Muddy Creek and its tributaries, which are part of the Little Snake River Basin (within the White-Yampa basin, **Map 5.4-1**). Impacts to Muddy Creek have already occurred and two portions of Muddy Creek are now listed on the State 303(d) list of Impaired or Threatened Waterbodies (WDEQ–WQD 2012). According to WDEQ, the impairment to the middle portion of Muddy Creek is primarily due to historic livestock grazing. The impairment to the lower portion of Muddy Creek is primarily due to exceedances of the chloride and selenium criteria (WDEQ–WQD 2012). The Little Snake River Conservation District (LSRCD) has been working through a Coordinated Resource Management (CRM) process with the BLM, landowners, grazing permittees, WGFD, and other stakeholders since 1992 to address these water quality and riparian habitat problems. As part of the CRM process, LSRCD has managed several Section 319 watershed improvement projects in the upper Muddy Creek drainage. According to WDEQ, the projects have resulted in considerable improvement to stream stability, aquatic habitat and riparian health, especially in the upper Muddy Creek tributaries (WDEQ–WQD 2012). While the CRM process is no longer formally in place, the beneficial effects are still being realized.

LSRCD and WGFD data indicate that improvement to stream stability, aquatic habitat and riparian areas has resulted from both of these projects and several reaches in Muddy Creek, Littlefield Creek, and McKinney Creek are meeting their aquatic life uses and have been removed from the 303(d) list. These projects are located in the Upper Muddy Creek Drainage outside of the project area.

The LSRCD and other stakeholders have also implemented another watershed improvement project to address physical degradation of the Muddy Creek stream channel, which threatens aquatic life-use support. This project is located along Muddy Creek on the west side of WY 789 in the project area and includes wetlands development, reestablishment of the floodplain and irrigation water management. This project has resulted in improving trends in riparian condition and bank stability.

Future actions that would result in cumulative impacts to Alternative F within the Muddy Creek Sub-basin include the Desolation Flats Natural Gas Development Project located adjacent and southwest of the project area, and the Atlantic Rim Natural Gas Field Development located east of and adjacent to the project area.





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Map 5.4-1. Watersheds associated with the CD-C project area

### 5.4.1 Cumulative Impacts Common to the CD-C Project-Specific and Watershed Analysis Areas

**Surface Water.** All alternatives would result in increased natural gas development in the CD-C project area, with the difference between alternatives being the magnitude of disturbance. Including the CD-C project, there are 13 currently operating or planned oil and gas development projects within the CD-C larger watershed analysis area (**Table 5.0-1**). The projects with the greatest potential to contribute to cumulative impacts to surface water resources would be the Moneta Divide, CD-C, and the Atlantic Rim Natural Gas Development projects. The CD-C and Atlantic Rim projects are adjacent to Muddy Creek, which as discussed below, is under special protection by the State of Wyoming. Historic development in the project area accounts for 60,176 acres of initial disturbance and 17,663 acres of long-term disturbance. Total historic development in the watershed analysis area has not been calculated. The Proposed Action and the alternatives would add disturbance of between 21,440 acres (Alternative E: No Action) and 47,200 acres (the Proposed Action). The long-term disturbance would range from 8,567 to 18,861 acres. The main cumulative impacts to surface-water resources from oil and gas development would be brought about by contamination of surface water from both authorized and accidental surface discharge of fluids and the impacts (including sediment loading) from surface disturbance related to project development/maintenance. These cumulative impacts would be greatest within the CD-C analysis area but the contamination of surface water and off-site sedimentation would extend downstream of the CD-C watershed analysis area. As part of the Atlantic Rim project, Upper Muddy Creek is currently monitored for sediment delivery from eroding streambanks, measurement of habitat features and stream geomorphology, and measurement of sediment concentrations and other water quality parameters.

Agriculture (irrigated crops, livestock grazing, and ranch management) and other natural resource uses within the CIAAs would result in increased surface runoff, accelerated erosion, and off-site sedimentation that would cause channel instability and degradation of surface-water quality. Because livestock tend to concentrate around available sources of water (stock reservoirs, stock tanks associated with water wells, and flowing streams) there would be localized effects in these areas, which could lead to greater erosion where anthropogenic surface disturbances and livestock concentration areas overlap. Two portions of Muddy Creek, which is within the White-Yampa watershed (**Map 3.4-1**), are now listed on the State 303(d) list of Impaired or Threatened Waterbodies due to habitat alteration, primarily due to historic livestock grazing (WDEQ–WQD 2012) and exacerbated by oil and gas development. The LSRCD has been working through a CRM process with the BLM, landowners, grazing permittees, WGFD, and other stakeholders since 1992 to address these water quality and riparian habitat problems. As part of the CRM process, LSRCD has managed several Section 319 watershed improvement projects in the upper Muddy Creek drainage. According to WDEQ, the projects have resulted in considerable improvement to stream stability, aquatic habitat and riparian health, especially in the upper Muddy Creek tributaries (WDEQ–WQD 2012). While the CRM process is no longer formally in place, the beneficial effects are still being realized. Although not agricultural in nature, accelerated erosion associated with oil and gas activities within the Muddy Creek sub-basin has been identified as having a role in exacerbating the degradation of lower Muddy Creek. Surface water impacts would be considered significant for at least one surface-water significance criterion through cumulative impacts if the Proposed Action or Alternative B, C, or D were selected. None would be considered significant if Alternatives E or F were selected.

Recreational activities and vehicular travel would have minimal effects on surface water, but could be more pronounced in localized areas due to off-road travel and additional access provided by resource development. Off-road travel in drainage areas would cause local impacts to surface waters. Impacts could be more significant where there is continuous federal land and the project improves or creates new access. Recreational activities and off-road travel are not expected to have significant effects on surface-water resources and would not contribute to the exceedance of the significance criteria discussed in **Section 4.4.4**.

Other industrial activities (i.e., mining, wind energy development, and construction of power transmission lines) would impact surface-water quality in localized areas within the cumulative impact area. The proposed Gateway West, Gateway South, and TransWest Express transmission line projects would cross the CIAAs and would have the potential to affect surface water during construction, operation, and decommissioning of the projects, particularly where the transmission corridors cross drainages. To the extent practical, however, these projects have been routed to minimize impacts to surface water resources. Additionally, these projects include mitigation measures and BMPs that would reduce to surface water impacts to minimal levels. The disturbance to CIAAs from these projects would be negligible. The BLM is the lead federal agency for the NEPA process for these proposed projects.

Wind-energy development projects have the potential to affect surface water during construction. These projects could result in contamination of surface water, increased surface runoff, erosion, and off-site sedimentation that would cause channel instability and degradation of surface-water quality, particularly where the development impacts drainage channels. The proposed CCSM is the nearest wind-energy development project; the western portion of the CCSM boundary is located approximately 7 miles east of the CD-C project area in Carbon County but the headwaters of Muddy Creek are within the CCSM project boundary.

**Groundwater.** As discussed in **Section 5.0**, natural gas exploration and development in the project area and the surrounding region has been ongoing since the 1940s. Since initiation of drilling, over 4,700 oil and gas wells have been drilled. The Proposed Action and Alternatives B, C, and F would result in the same number of new natural gas wells drilled (8,950). Alternative D would result in the drilling of 7,894 wells, a 12-percent reduction from the Proposed Action. Alternative E (No Action) would result in an estimated 4,063 wells on 2,783 well pads. Because each alternative has a different number of well pads, the alternative with the lowest number of pads would minimize risk of contamination of the groundwater resource. Cumulative groundwater impacts would occur during the removal of groundwater; from improper drilling operations; from accidental releases of fluids (spills) associated with drilling and fracturing operations, produced water, and other hazardous liquids to soils and surface-water systems; and through subsurface disposal (injection) of produced water. These impacts are the same as the project specific impacts described in **Section 4.4.4**. Cumulative groundwater impacts are not expected to be significant and would not contribute to the exceedance of the significance criteria discussed in **Section 4.4.4**.

## 5.4.2 Cumulative Impacts within the CD-C project area

**Surface Water.** The types of cumulative surface-water impacts would be the same as those discussed in **Section 5.4.1**. Disturbance related to current oil and gas development has already occurred. Cumulative impacts, particularly from the CD-C and Atlantic Rim projects, would exacerbate current degradation on Muddy Creek. Since the CD-C project would be the largest contributor to cumulative impacts, successfully utilizing BMPs and COAs listed in **Appendix C** would reduce the potential for adding to cumulative impacts. Surface water impacts would be considered significant for at least one surface-water significance criteria through cumulative impacts if the Proposed Action or any of the action alternatives were selected.

**Groundwater.** The types of cumulative groundwater impacts would be the same as those discussed in **Section 5.4.1**. Using the available estimates of water use included in the NEPA analyses of projects still in development within the project area, the total cumulative water demand over the lives of the six projects within the CD-C project area would be 40,470 ac-ft (BLM 2004, 2005e, 2006a, 2007f, 2010d, and 2011b). This amount is approximately 0.4 percent of the estimated volume of producible groundwater available (9.67 million ac-ft) in the Tertiary-age aquifers underlying the project area (calculated from information in Cleary *et al.* 2010). Available water is also found in Quaternary, Upper and Lower Cretaceous, and Jurassic age aquifers. Fisk (1967) estimated that the amount of moderately good-quality groundwater within the Great Divide Structural Basin was 500 million ac-ft and 300 million ac-ft within

the Washakie Structural Basin. The combined annual recharge for the Great Divide and Washakie structural basins has been estimated at 11,300 ac-ft (Fisk 1967), which is well above the estimated annual 2,700 ac-ft. of water removed for development of the projects within the CD-C study area. Cumulative groundwater impacts are not expected to be significant.

### 5.4.3 Cumulative Impacts within the Watershed Area

**Surface Water.** The types of cumulative surface-water impacts would be the same as those discussed in **Section 5.4.1**. Surface water impacts would be considered significant for at least one surface-water significance criteria through cumulative impacts if the Proposed Action or any of the alternatives were selected.

There are two existing large-scale coal mines (Black Butte and Jim Bridger) located within the watershed analysis area. Impacts to surface water from mining activities include increases in runoff, turbidity, and sedimentation within the project area due to disturbances to vegetation and soil resources. Permit requirements and compliance with rules and regulations associated with surface mining are under the jurisdiction of the WDEQ with Office of Surface Mining Reclamation and Enforcement (OSM) oversight. These mines are not expected to contribute measurably to the exceedance of the significance criteria discussed in **Section 4.4.4**.

The existing Sweetwater uranium mill (currently not operational) and the Lost Creek *In-Situ* Uranium Recovery (ISR) Projects are located in the Great Divide Basin northeast of the project area. These projects have the potential to impact surface water during construction/operation through ground disturbance and vegetation removal or if leachate is accidentally discharged into surface waters. The Nuclear Regulatory Commission (NRC) oversees uranium source and byproduct material license applications and the WDEQ has authority over permits to mine for uranium operations.

As stated in **Section 5.4.1**, wind-energy development and industrial development projects have the potential to affect surface water during construction. The proposed Sweeney Ranch Wind Park is located approximately 18 miles west of the project area in Sweetwater County and the Middlewood Wind Power Project is located approximately 22 miles east of the project area in Carbon County.

Downstream demands for water in the Green River and Little Snake River drainages would continue to influence water management in the Upper Green and White-Yampa basins, respectively. According to the 2010 Green River Management Plan, which provides a 50-year projection of water use in watersheds that include the Upper Green and White-Yampa basins in Wyoming, approximately 680,000 ac-ft/year would be depleted from the Basin from all sources (agriculture, municipal, domestic, industrial, recreational, environmental, and evaporation) under a moderate growth scenario by 2060 (Wyoming Water Development Office 2011). Wyoming's estimated 2060 allocation of the Upper Colorado River water under the Colorado River Compact totals approximately 847,000 ac-ft/year, which would mean that approximately 167,000 (847,000–680,000) ac-ft/year would remain under the Compact allocation (Wyoming Water Development Office 2011). No surface water would be used for any part of the well drilling or construction process so the proposed project would not contribute to surface-water depletion within the Colorado River system.

According to the WDEQ–WQD database, there are currently 23 active CBM, oil-and-gas-related, industrial, or coal mining WYPDES discharge permits in the cumulative watershed area (WDEQ–WQD 2011). The Proposed Action does not include plans for any surface discharge of produced water. It is therefore assumed that all water produced would be injected or evaporated and no additional discharge permits would be necessary for the surface disposal of produced water. Permitting for surface discharge of produced water related to federal land or minerals would require a separate NEPA evaluation.

**Groundwater.** The types of cumulative groundwater impacts would be the same as those discussed in **Section 5.4.1**. Using the available estimates of water use included in the NEPA analyses of oil and gas



projects that are still in development in the watershed analysis area, the total cumulative water demand from oil and gas development would be approximately 68,000 ac-ft over the lives of the currently operating or planned oil and gas development projects within the watershed study area (BLM 2004a, 2005e, 2006a, 2007f, 2009b, 2010d, 2011b, and 2011c). This amount is approximately 0.1 percent of the estimated volume of producible groundwater available (75.2 million ac-ft) in Tertiary-age aquifers underlying the Greater Green River Basin (Cleary *et al.* 2010). Producing groundwater is also found in Quaternary, Upper and Lower Cretaceous, and Jurassic age aquifers. Fisk (1967) estimated that the amount of moderately good-quality groundwater within the Great Divide Structural Basin was 500 million ac-ft and 300 million ac-ft within the Washakie Structural Basin. The combined annual recharge for the Great Divide and Washakie structural basins has been estimated at 11,300 ac-ft (Fisk 1967), which is much greater than the estimated annual demand of 4,440 ac-ft removed for development within the CD-C watershed study area.

Development of CBM resources in the CD-C project area could contribute to estimated drawdown in the Atlantic Rim project area. Because of the limited number of wells, the intensity of such impacts would be substantially less than impacts associated with development in the Atlantic Rim project area.

The Black Butte and Jim Bridger coal mines are located within the watershed analysis area. Impacts of mining, including cumulative hydrologic impacts, are regulated by WDEQ–LQD with oversight by OSM. The mine pits/active workings would be completely dewatered, which would result in drawdown of formation aquifers in the vicinity of the mining activities. These mines are not expected to contribute measurably to exceedance of the significance criteria discussed in **Section 4.4.4** since the extent of drawdown would be limited due to the lack of lateral continuity of the water-bearing units in the affected formation.

The Sweetwater Mill project has the potential to impact groundwater through accidental discharge from the existing tailings impoundment; the impoundment is reported to have leaked several times between 1980 and 1984. Contamination did not leave the site but did enter the upper aquifer. Subsequent remedial actions are reducing the extent of contaminated groundwater. Contaminated soil is being excavated and placed into the existing tailings impoundment and contaminated groundwater is being extracted and placed into the existing tailings impoundment (NRC 2011). The proposed Lost Creek/Lost Soldier project will impact groundwater during recovery and injection well construction and completion or from spills and leaks, excursions, wellfield development drilling, or deep well injection. The NRC oversees uranium source and byproduct material license applications and the WDEQ has authority over permits to mine for uranium operations, while the BLM is the surface land management agency.

## 5.5 AIR QUALITY

The CAMx model was used to quantify the impacts to regional air quality and air quality related values (AQRVs) resulting from the CD-C project, other proposed oil and gas developments in the study area (Reasonably Foreseeable Development, or RFD), and all other regional emissions sources within the study area. Since the CAMx photochemical grid model was used in the far-field air quality analysis, the impacts of emissions sources outside the southwest Wyoming study area were also included via transport of these emissions and their chemical reaction products into the study area.

CAMx was used to assess the impacts to both ambient air concentrations and AQRVs from air pollutant emissions of nitrogen oxide, carbon monoxide, sulfur dioxide, PM<sub>10</sub>, PM<sub>2.5</sub>, and VOC expected to result from CD-C project emissions combined with regional emissions throughout the study area. The cumulative study considers 2008 as a baseline year for emissions and assesses impacts to air quality at peak project year emissions levels that are expected to occur in year 2022. Air quality impacts are assessed for the year 2022, and AQRV impacts are assessed for 2022 and relative to year 2008 levels. The



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CAMx model was run with both 2008 and 2022 emissions (including the CD-C project area emissions) for 2 years (2005 and 2006) of meteorological data.

The cumulative assessment was performed primarily using the Proposed Action emissions in addition to other regional emissions. The cumulative impacts resulting from Alternatives B, C, D, and F would be similar to impacts of the Proposed Action. Under Alternative E (No Action), although the project emissions would be lower than under the other alternatives, the cumulative impacts to air quality and AQRVs (atmospheric deposition, visibility, and lake acid neutralizing capacity [ANC] change) would also be similar to the cumulative assessment results presented since the project alternative emissions comprise a small fraction of the total regional emissions inventory.

### 5.5.1 Emissions from Regional Sources

Maximum emissions from RFD sources within the study area were estimated. RFD is defined as (1) air emissions from the undeveloped portions of authorized NEPA projects and RMPs, and (2) air emissions from not-yet-authorized NEPA projects (if emissions are quantified when modeling commences). RFD information from not-yet-authorized projects was provided by the BLM and was based on ongoing air quality analyses for NEPA projects.

Full development of proposed projects inventoried as RFD may or may not coincide with full development of the CD-C project. As a result, the assumption that all RFD are fully developed during the maximum year of CD-C project development results in conservatism in the cumulative impact analysis. A listing of RFD projects which were included in this study, as defined in the paragraph above, is presented in **Table 5.5-1**. The locations of the RFD projects are shown in Figure 2-16 of the AQTSD.

**Table 5.5-1. RFD emissions within the study area**

RFD Project	Inventory Year	Emissions (tpy)					
		Nitrogen dioxide	VOC	Carbon monoxide	Sulfur dioxide	PM <sub>10</sub>	PM <sub>2.5</sub>
Beaver Creek	2016	105	85	103	0	89	14
LaBarge Platform	2027	676	1,534	383	96	110	36
NPL	2022	472	310	623	10	968	145
Monell Arch	2021	253	276	220	8	33	17
Moneta Divide	2018	1,035	3,662	364	0	1,108	140
Rock Springs Field Office	2031	998	3,318	2,369	1	516	93
Little Snake Field Office – Alt B (Preferred)	2021	559	2,712	1,103	3	378	55
Kremmling Field Office – Alt. C (Preferred)	2028	738	5,914	191	3	2,473	408
White River Field Office	2021	3,320	8,564	7,054	20	1,037	198
Colorado River Valley Field Office	2021	2,287	9,240	4,525	8	916	155
Grand Junction Field Office – Alt B (Preferred)	2018	3,373	2,686	4,160	135	2,397	525
Uncompahgre Field Office – Alt. D (Preferred)	2028	3,271	2,498	3,327	138	1,118	494
Bird Canyon	2020	658	641	481	5	250	64
Moxa Arch Existing Wells	2018	1,550	19,596	1,178	1	232	79
Moxa Arch Proposed Action New Wells	2018	1,186	1,647	1,776	0	583	124
Moxa Arch Proposed Action ROD Wells	2018	64	166	128	0	30	6
Hiawatha Existing Wells (CO & WY)	2017	318	4,136	352	0	41	9
Hiawatha Proposed Action New Wells (CO & WY)	2017	1,555	919	1,861	1	318	100
Pinedale	*	1,381	2,286	1,250	53	53	79
Jonah	2008	1,099	2,705	686	62	62	28
<b>Total</b>		<b>24,899</b>	<b>72,895</b>	<b>32,133</b>	<b>545</b>	<b>12,712</b>	<b>2,768</b>

\* Based on the Pinedale SEIS Alternative C Phase II emissions levels.

**Tables 5.5-2, 5.5-3, and 5.5-4** summarize the complete regional emission inventories for the study area (the 4-km modeling domain shown in **Figure 4.5-1**). The tables report the modeled emissions of nitrogen oxides, carbon monoxide, sulfur dioxide, PM<sub>10</sub>, and PM<sub>2.5</sub>, and total organic gas, for each state and emissions source category. Emissions tables are presented for 2008, 2022, and the difference between the 2022 future-year and 2008 baseline inventories (2022–2008). For each year and for the 2022–2008 difference, emissions are reported for the 2005 meteorological year. (Emissions for both the 2005 and 2006 scenarios are reported in Section 2 of the AQTSD.)

**Tables 5.5-2, 5.5-3, and 5.5-4** contain emissions for all portions of Wyoming, Colorado, Utah, and Idaho that are within the 4-km modeling domain that comprise the study area. In **Table 5.5-4**, there are zero entries for the 2022–2008 change natural emissions because the 2005 actual emissions were used in both 2008 and 2022 emission scenarios.

**Table 5.5-4** shows that on-road mobile emissions would decrease for all pollutants in all areas between 2008 and 2022, due to increasingly stringent emissions controls. Non-road emissions also decline for all areas for all pollutants except carbon monoxide. This would occur because of the implementation of non-road engine tier standards that require increasingly cleaner-burning engines as fleet turnover occurs. Non-oil and gas area source emissions would increase for all pollutants within Wyoming going from 2008 to 2022, except PM<sub>2.5</sub>. Nitrogen oxides and total organic gas emissions would increase for non-oil-and-gas-area source emissions for all four states in 2022 relative to 2008. This is reasonable because future area source emissions are often projected using population changes as a basis for calculating changes in emissions. 2008 to 2022 changes in electricity generating units (EGU) emissions and non-EGU (NEGU) point source emissions vary by state and pollutant.

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**Table 5.5-2. Regional emissions summary table for the baseline 2008 year (tpy), met05**

STATE	Source Category						
	Oil and Gas	Area	Onroad	Offroad	EGU	NEGU	Natural
<b>Carbon Monoxide</b>							
Colorado	1,029	2,448	18,082	7,931	1,356	58	12,277
Idaho	263	487	2,563	4,545	0	10,909	23,477
Utah	18,383	1,974	19,482	12,212	426	645	20,297
Wyoming	12,314	13,842	71,563	36,344	3,338	17,374	26,789
<b>Nitrogen Oxides</b>							
Colorado	1,712	152	1,730	1,245	28,689	86	632
Idaho	1,282	340	300	675	0	1,932	927
Utah	11,490	214	1,920	1,771	7,209	1,130	655
Wyoming	21,636	7,135	8,560	19,095	38,528	14,813	1,229
<b>Total Organic Gas</b>							
Colorado	77,019	1,608	1,390	1,703	137	267	53,123
Idaho	547	3,895	207	1,458	0	10	32,887
Utah	410,056	2,015	1,430	3,533	64	2,057	13,954
Wyoming	1,127,405	18,564	5,755	5,816	1,079	22,735	81,173
<b>PM<sub>10</sub></b>							
Colorado	62	10,626	48	135	410	3,852	320
Idaho	0	9,359	9	96	0	469	1,950
Utah	442	7,454	55	203	570	225	2,602
Wyoming	524	52,967	241	978	9,598	14,740	1,032
<b>Sulfur Dioxide</b>							
Colorado	20	80	11	33	7,794	4	20
Idaho	1	15	2	18	0	8,918	125
Utah	181	144	12	44	973	6	159
Wyoming	5,502	6,419	52	407	43,978	15,571	65
<b>PM<sub>2.5</sub></b>							
Colorado	61	1,415	31	128	0	0	293
Idaho	0	184	6	91	0	376	1,716
Utah	435	972	36	192	471	145	2,396
Wyoming	524	7,084	163	939	9,598	2,678	914

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**Table 5.5-3. Regional emissions summary table for the 2022 year (tpy), met05**

STATE	Source Category						
	Oil and Gas	Area	Onroad	Offroad	EGU	NEGU	Natural
<b>Carbon Monoxide</b>							
Colorado	3,443	2,519	15,010	8,426	1,735	67	12,277
Idaho	326	535	2,057	4,583	0	17,670	23,477
Utah	41,880	1,960	16,241	11,877	1,469	109	20,297
Wyoming	30,377	14,596	55,748	37,856	3,816	14,182	26,789
<b>Nitrogen Oxides</b>							
Colorado	3,308	177	773	849	24,166	89	632
Idaho	896	402	128	478	0	2,378	927
Utah	12,972	244	855	1,272	8,386	112	655
Wyoming	30,498	8,261	3,576	15,066	39,072	12,748	1,229
<b>Total Organic Gases</b>							
Colorado	37,314	1,850	823	1,147	183	323	53,123
Idaho	673	5,214	120	1,174	0	7	32,887
Utah	1,059,791	2,668	859	2,300	114	1,673	13,954
Wyoming	1,335,304	22,192	3,240	4,261	683	25,291	81,173
<b>PM<sub>10</sub></b>							
Colorado	2,449	10,544	37	75	592	3,504	320
Idaho	0	9,454	6	62	0	0	1,950
Utah	5	7,134	41	112	887	267	2,602
Wyoming	5,415	73,379	164	610	3,399	13,320	1,032
<b>Sulfur Dioxide</b>							
Colorado	25	83	10	3	7,002	5	20
Idaho	2	15	2	1	0	3,921	125
Utah	18	142	11	3	1,645	10	159
Wyoming	3,652	7,458	45	19	22,374	23,588	65
<b>PM<sub>2.5</sub></b>							
Colorado	529	1,404	18	70	0	0	293
Idaho	0	206	3	58	0	0	1,716
Utah	459	908	21	106	561	169	2,396
Wyoming	1,721	6,773	83	611	4,114	1,776	914

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**Table 5.5-4. Regional 2022-2008 emissions difference summary table (tpy), met 05.**

Unshaded areas indicate a decrease; shaded areas indicate an increase.

STATE	SOURCE CATEGORY						
	Oil and Gas	Area	Onroad	Offroad	EGU	NEGU	Natural
<b>Carbon Monoxide</b>							
Colorado	2,414	71	-3,072	495	379	9	0
Idaho	63	48	-506	38	0	6,760	0
Utah	23,497	-14	-3,241	-335	1,043	-535	0
Wyoming	18,063	754	-15,815	1,512	478	-3,191	0
<b>Nitrogen Oxides</b>							
Colorado	1,595	25	-956	-396	-4,523	4	0
Idaho	-386	63	-173	-197	0	445	0
Utah	1,482	30	-1,065	-499	1,177	-1,017	0
Wyoming	8,862	1,126	-4,985	-4,028	544	-2,065	0
<b>Total Organic Gases</b>							
Colorado	-39,705	241	-567	-555	46	56	0
Idaho	126	1,320	-87	-284	0	-3	0
Utah	649,735	653	-571	-1,233	49	-384	0
Wyoming	207,899	3,629	-2,516	-1,555	-396	2,555	0
<b>PM<sub>10</sub></b>							
Colorado	2,387	-82	-11	-60	182	-348	0
Idaho	0	95	-3	-34	0	-468	0
Utah	-438	-320	-14	-90	316	42	0
Wyoming	4,891	20,412	-77	-369	-6,199	-1,419	0
<b>Sulfur Dioxide</b>							
Colorado	5	3	-1	-30	-792	1	0
Idaho	0	1	0	-17	0	-4,997	0
Utah	-163	-2	-1	-42	672	4	0
Wyoming	-1,850	1,039	-7	-387	-21,604	8,017	0
<b>PM<sub>2.5</sub></b>							
Colorado	468	-11	-13	-58	0	0	0
Idaho	0	22	-3	-33	0	-376	0
Utah	24	-64	-16	-86	90	24	0
Wyoming	1,197	-311	-79	-328	-5,484	-902	0

### 5.5.2 Criteria Pollutant Impacts

The results of the cumulative modeling showed that there were no exceedances of the NAAQS, WAAQS, or CAAQS for the criteria pollutants carbon monoxide, nitrogen oxides, sulfur dioxide, PM<sub>2.5</sub>, or PM<sub>10</sub> within the study area that were related to CD-C project emissions. There were predicted exceedances of the carbon monoxide (8-hour), PM<sub>10</sub> (24-hour), and sulfur dioxide (1-hour) standards which were highly localized and in the immediate vicinity of sources unrelated to the CD-C project.

The 70 ppb 2015 ozone NAAQS would be attained throughout the modeling domain in the 2022 future year except in Sublette and Fremont Counties in Wyoming and in northern Colorado. Examination of the spatial scale and magnitude of the CD-C project contribution to criteria pollutant concentrations within the study area shows that exceedances of the ambient air quality standards in the 2022 future-year modeling would not result from emissions from the CD-C project.

For the Proposed Action modeling scenario, the MATS results showed that the 70 ppb 2015 ozone NAAQS would be attained throughout the study area in the 2022 future year except in Sublette and Fremont Counties in Wyoming and in northern Colorado using both 2005 and 2006 meteorology. The NAAQS exceedances in Sublette County are influenced by high observed winter ozone measurements at the Boulder, WY monitor. Exceedances in northern Colorado occur in the vicinity of the Fort Collins Metropolitan Area. The contribution of the CD-C project emissions to modeled 2022 future-year exceedances of the 70 ppb NAAQS at ozone monitors in the study area is <0.1 ppb. Examination of the spatial extent and magnitude of the Proposed Action and No Action Alternative contributions to 2022 Design Values within the study area shows that none of the exceedances of the ambient air quality standards 70 ppb NAAQS in the 2022 future-year modeling have significant contributions from emissions from the CD-C project.

Future-year ozone Design Values in the vicinity of the CD-C project area are projected by MATS to be in the range of 60–69 ppb and to attain the 70 ppb 2015 NAAQS. The absolute CAMx model concentrations show values of the future year 4<sup>th</sup> high 8-hour average ozone exceeding 70 ppb in the CD-C project area using 2006 meteorology (maximum value of 72.9 ppb); however, all values of future year 4<sup>th</sup> high 8-hour average ozone in the CD-C project area are less than 70 ppb using 2005 meteorology. The 2-year average 4<sup>th</sup> high 8-hour average ozone concentrations that approximate Design Values in the absolute modeling results indicate a maximum value of 70.1 ppb within the CD-C project area. Using the EPA convention for calculating Design Values, this corresponds to a Design Value of 70 ppb, which is less than 71 ppb and therefore does not exceed the NAAQS. The 2-year average CAMx concentration results are consistent with the MATS results that show no ozone Design Values exceeding the NAAQS in the CD-C project area.

Using the absolute modeling results, the Proposed Action emissions contributed 1.3 ppb or less (1.8 percent or less) to monitors in the study area with high modeled ozone (daily maximum 8-hour average ozone >70 ppb). Alternative E (No Action) emissions contributed 0.61 ppb or less (0.81 percent or less) to monitors in the study area with modeled 8-hour ozone greater than 70 ppb. The monitors with the largest contribution from project alternative emissions were those in closest proximity to the project area and most frequently downwind of it: Wamsutter, Atlantic Rim, Sun Dog, and Spring Creek. In Sublette County, ozone impacts due to the Proposed Action would be less than or equal to 0.04 ppb. The 2-year approximation to a 2022 Design Value obtained using absolute model concentrations shows the CD-C Proposed Action maximum ozone impact would be 1.7 ppb. For both the absolute modeled concentration and MATS results, the largest ozone impacts due to the Proposed Action emissions would be in the vicinity of the CD-C project area.

In addition, PSD increments would not be exceeded at any Class I or sensitive Class II area within the study area. Additional detail on the modeling results is provided in Section 4 of the AQTSD.

### Mid-Field Impacts

CAMx-estimated criteria pollutant impacts from the CD-C project and regional sources within and near the CD-C project area as shown in **Table 5.5-5**, which shows that the cumulative impacts resulting from project and regional sources, would be below the WAAQS and NAAQS for carbon monoxide, nitrogen dioxide, sulfur dioxide, PM<sub>2.5</sub>, or PM<sub>10</sub>.

Using the absolute CAMx model ozone concentrations, there would be no exceedances of the 70 ppb ozone NAAQS in the CD-C project area in the 2022 future year using 2005 meteorology, but there would be exceedances of the NAAQS using 2006 meteorology (maximum value of 72.9 ppb). The approximation to an ozone Design Value produced with the 2 available years of absolute modeling results has a maximum value of 70.1 ppb within the CD-C project area. Using the EPA truncation convention for Design Values, this corresponds to a Design Value of 70 ppb, which is less than 71 ppb and therefore does not exceed the NAAQS. Using the MATS-projected future-year ozone Design Values, there would be no exceedances of the 2015 NAAQS within the CD-C project area.

**Table 5.5-5. CD-C project and regional sources, mid-field criteria pollutant modeling results**

Pollutant	Averaging Time	Modeled Concentration from All Sources	WAAQS	NAAQS
Carbon monoxide ((µg/m <sup>3</sup> ))	1-hour	715.0	40,000	40,000
	8-hour	408.7	10,000	10,000
Nitrogen dioxide (µg/m <sup>3</sup> )	1-hour	65.8 <sup>1</sup>	188	188
	Annual	13.8	100	100
Ozone (ppb)	8-hour	72.9 <sup>3</sup>	75	70
Sulfur dioxide (µg/m <sup>3</sup> )	1-hour	49.5 <sup>2</sup>	196	196
	3-hour	30.5	1,300	1,300
PM <sub>10</sub> (µg/m <sup>3</sup> )	24-hour	55.8	150	150
	Annual	7.6	50	n/a
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	24-hour	8.4	35	35
	Annual	3.8	12	12

<sup>1</sup> Nitrogen dioxide 1-hour concentration is eighth-highest daily maximum 1-hour concentration.

<sup>2</sup> Sulfur dioxide 1-hour concentration is fourth-highest daily maximum 1-hour concentration.

<sup>3</sup> Exceedance of the 2015 NAAQS occurs only for 2006 meteorology. No exceedance occurs for 2005 meteorology or for average of results using 2005 and 2006 meteorology (maximum value of 70.1 ppb).

### 5.5.3 Visibility Impacts

The cumulative visibility analysis follows the approach that was developed by the USFWS and National Park Service and was documented in a letter sent on February 10, 2012 to the WDEQ – Air Quality Division. The approach uses the two EPA Regional Haze Rule (RHR) metrics goals:

- Improvement in visibility for the 20 percent worst visibility days
- No worsening in visibility for the 20 percent best visibility days

Although the cumulative visibility approach uses the RHR metrics, the cumulative visibility analysis for the CD-C project and regional emissions sources is not comparable to a state's RHR State Implementation Plan analysis because different basic assumptions are used in the analysis, such as different future emissions years, different emissions projections, and different observed visibility baseline years.

The CAMx 2008 and 2022 model outputs were used to project the observed visibility conditions at IMPROVE sites within the 4 km domain from the baseline period (2006–2010) to 2022 for the worst 20-percent and best 20-percent days, using the EPA's Modeled Attainment Test Software (MATS) tool. 2022 visibility projections for the worst 20-percent and best 20-percent days were also made without the CD-C

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project emissions and without the combined effects of the CD-C project emissions and RFD sources. This allows an assessment of the effects of emissions from the CD-C project emissions and the combined CD-C project emission plus RFD emissions on the RHR visibility metrics.

**Tables 5.5-6 through 5.5-9** indicate improved visibility in 2022 compared to the 2006–2010 baseline years at all the Class I and Class II areas for the Proposed Action for both the best and worst 20-percent days. Impacts from the Proposed Action plus RFD sources on 2022 haze are estimated to vary between 0.01 dv and 0.18 dv among the Class I and Class II areas. A more detailed explanation of the methodology and specifics on the MATS configuration is provided in the AQTSD Section 4.6.1.5.

**Table 5.5-6. Cumulative visibility results for best 20-percent days using 2005 meteorology**

<b>Class I or Class II Area</b>	<b>Baseline Visibility (2006-2010) (dv)</b>	<b>Proposed Action Alternative (Cumulative 2022 Visibility) (dv)</b>	<b>No Proposed Action and No RFD Sources (Cumulative 2022 Visibility) (dv)</b>	<b>Difference Between Proposed Action Alternative and No Proposed Action and No RFD Sources (dv)</b>
Bridger WA	1.39	1.17	1.14	0.03
Fitzpatrick WA	1.39	1.19	1.16	0.03
Mount Zirkel WA	0.95	0.74	0.66	0.08
Rawah WA	0.95	0.67	0.58	0.09
Dinosaur NM	0.95	0.82	0.76	0.06
Popo Agie WA	1.39	1.28	1.15	0.13
Savage Run WA	0.95	0.62	0.49	0.13
Wind River RA	1.39	1.17	1.13	0.04
Rocky Mountain NP	1.91	1.77	1.61	0.16
Eagles Nest WA	0.69	0.48	0.47	0.01
Flat Tops WA	0.69	0.41	0.30	0.11
Gros Ventre WA	1.39	1.18	1.16	0.02

**Table 5.5-7. Cumulative visibility results for worst 20-percent days using 2005 meteorology**

<b>Class I or Class II Area</b>	<b>Baseline Visibility (2006-2010) (dv)</b>	<b>Proposed Action Alternative (Cumulative 2022 Visibility) (dv)</b>	<b>No Proposed Action and No RFD Sources (Cumulative 2022 Visibility) (dv)</b>	<b>Difference Between Proposed Action Alternative and No Proposed Action and No RFD Sources (dv)</b>
Bridger WA	10.58	10.28	10.23	0.05
Fitzpatrick WA	10.58	10.27	10.24	0.03
Mount Zirkel WA	9.36	9.09	9.01	0.08
Rawah WA	9.36	9.05	8.95	0.10
Dinosaur NM	9.36	9.09	9.02	0.07
Popo Agie WA	10.58	10.45	10.29	0.16
Savage Run WA	9.36	8.97	8.83	0.14
Wind River RA	10.58	10.26	10.21	0.05
Rocky Mountain NP	12.04	11.89	11.73	0.16
Eagles Nest WA	8.68	8.34	8.32	0.02
Flat Tops WA	8.68	8.48	8.33	0.15
Gros Ventre WA	10.58	10.31	10.29	0.02



**Table 5.5-8. Cumulative visibility results for best 20 percent days using 2006 meteorology**

Class I or Class II Area	Baseline Visibility (2006-2010) (dv)	Proposed Action Alternative (Cumulative 2022 Visibility) (dv)	No Proposed Action and No RFD Sources (Cumulative 2022 Visibility) (dv)	Difference Between Proposed Action Alternative and No Proposed Action and No RFD Sources (dv)
Bridger WA	1.39	1.22	1.19	0.03
Fitzpatrick WA	1.39	1.24	1.22	0.02
Mount Zirkel WA	0.95	0.75	0.67	0.08
Rawah WA	0.95	0.68	0.59	0.09
Dinosaur NM	0.95	0.85	0.80	0.05
Popo Agie WA	1.39	1.34	1.21	0.13
Savage Run WA	0.95	0.66	0.53	0.13
Wind River RA	1.39	1.21	1.17	0.04
Rocky Mountain NP	1.91	1.80	1.65	0.15
Eagles Nest WA	0.69	0.52	0.50	0.02
Flat Tops WA	0.69	0.48	0.36	0.12
Gros Ventre WA	1.39	1.24	1.22	0.02

**Table 5.5-9. Cumulative visibility results for worst 20 percent days using 2006 meteorology**

Class I or Class II Area	Baseline Visibility (2006-2010) (dv)	Proposed Action Alternative (Cumulative 2022 Visibility) (dv)	No Proposed Action and No RFD Sources (Cumulative 2022 Visibility) (dv)	Difference Between Proposed Action Alternative and No Proposed Action and No RFD Sources (dv)
Bridger WA	10.58	10.30	10.28	0.02
Fitzpatrick WA	10.58	10.32	10.31	0.01
Mount Zirkel WA	9.36	9.16	9.05	0.11
Rawah WA	9.36	9.11	8.99	0.12
Dinosaur NM	9.36	9.10	9.02	0.08
Popo Agie WA	10.58	10.56	10.40	0.16
Savage Run WA	9.36	9.01	8.83	0.18
Wind River RA	10.58	10.27	10.24	0.03
Rocky Mountain NP	12.04	11.68	11.53	0.15
Eagles Nest WA	8.68	8.29	8.26	0.03
Flat Tops WA	8.68	8.37	8.20	0.17
Gros Ventre WA	10.58	10.32	10.31	0.01

#### 5.5.4 Atmospheric Deposition Impacts

Modeled wet and dry fluxes of sulfur- and nitrogen-containing species due to emissions from the CD-C project and all other cumulative regional sources were processed to estimate total annual sulfur and nitrogen deposition values at each PSD Class I and sensitive PSD Class II area. Maximum predicted sulfur and nitrogen deposition impacts were estimated for existing emissions sources within the CD-C project area taken together with the cumulative effects of all sources in the region.

**Table 5.5-10** shows maximum predicted total nitrogen and sulfur deposition impacts from all emission sources for the year 2022 from either of the 2005 and 2006 meteorology data sets. Estimated cumulative nitrogen deposition impacts at all Class I and sensitive Class II areas within the study area, with the exception of the Eagles Nest Wilderness Area, would be above the critical load thresholds. Estimated sulfur deposition impacts would be below the 5.0 kg/ha/yr threshold at all the analyzed areas. Cumulative

nitrogen deposition impacts can be addressed by a number of mitigation or development strategies designed to minimize nitrogen oxide emissions from the project. These mitigation strategies are further described in **Section 4.5.6, Unavoidable Adverse Impacts and Additional Mitigation Measures**. Deposition impacts are summarized in detail in Section 4.6.2 of the AQTSD.

**Table 5.5-10. Cumulative nitrogen and sulfur deposition impacts**

Class I or Sensitive Class II Area	Cumulative Nitrogen Deposition (kg/ha/yr)	Nitrogen Critical Load (kg/ha/yr)	Cumulative Sulfur Deposition (kg/ha/yr)	Sulfur Critical Load (kg/ha/yr)
Bridger Wilderness Area	2.85	2.2	1.61	5.0
Fitzpatrick Wilderness Area	3.17	2.2	1.66	5.0
Mount Zirkel Wilderness Area	5.40	2.3	3.25	5.0
Rawah Wilderness Area	4.43	2.3	2.67	5.0
Dinosaur National Monument	5.92	3.0	4.03	5.0
Popo Agie Wilderness Area	3.62	2.2	1.95	5.0
Savage Run Wilderness Area	2.67	2.2	1.24	5.0
Wind River Roadless Area	3.49	2.2	2.04	5.0
Gros Ventre Wilderness Area	4.83	2.2	2.85	5.0
Rocky Mountain National Park	5.86	2.3	3.80	5.0
Eagles Nest Wilderness Area	1.90	2.3	0.74	5.0
Flat Tops Wilderness Area	3.36	2.3	2.07	5.0

There is substantial peer-reviewed evidence that suggests nitrogen deposition is a significant concern for ecosystems similar to those in Rocky Mountain National Park and Dinosaur National Monument. A risk assessment evaluating the sensitivity of NPS areas to nutrient enrichment effects from nitrogen deposition ranked ecosystems in Dinosaur NM as highly sensitive to nitrogen impacts.<sup>1</sup> Further, Pardo et al. (2011) synthesized, evaluated, and extrapolated nitrogen critical loads values for ecoregions across the United States and concluded that the cumulative critical load necessary to protect shrublands and lichen communities similar to those in Dinosaur NM is 3 kg/ha/year total deposition. The maximum modeled cumulative future deposition for many of the Class I and Class II areas analyzed is predicted to exceed, or is already exceeding, critical loads value reported in the Pardo work. As deposition approaches and/or exceeds the critical load, these ecosystems are at risk of changes in plant communities, including loss of native species, invasions of unwanted species like cheatgrass, changes in nutrient cycling, loss of biodiversity, and other negative effects.

**Table 5.5-11** shows the 2022–2008 change in maximum nitrogen and sulfur deposition at all Class I/II areas from either of the 2005 and 2006 meteorology data sets. The modeling results indicate that cumulative nitrogen and sulfur deposition impacts in 2022 would decrease in all Class I/II areas relative to year 2008. The decrease in nitrogen deposition is due to various regulatory programs that will reduce nitrogen oxide emissions in 2022 compared to 2008. New proposed oil and gas development in the region would increase the deposition load to the Class I/II areas.

<sup>1</sup> Sullivan, T. J., T. C. McDonnell, G. T. McPherson, S. D. Mackey, and D. Moore. 2011. Evaluation of the sensitivity of inventory and monitoring National Parks to nutrient enrichment effects from atmospheric nitrogen deposition: Northern Colorado Plateau Network (NCPN). Natural Resource Report NPS/NRPC/ARD/NRR—2011/321. National Park Service, Denver, Colorado. Available at <http://www.nature.nps.gov/air/Pubs/pdf/n-sensitivity.cfm>.

**Table 5.5-11. 2022–2008 change in cumulative nitrogen and sulfur deposition**

Class I or Sensitive Class II Area	Nitrogen Deposition		Sulfur Deposition	
	Deposition (kg/ha/yr)	% Change	Deposition (kg/ha/yr)	% Change
Bridger Wilderness Area	-0.3221	-10.54	-0.2726	-14.51
Fitzpatrick Wilderness Area	-0.3118	-8.97	-0.1755	-12.95
Mount Zirkel Wilderness Area	-0.6458	-10.69	-0.3921	-10.77
Rawah Wilderness Area	-0.5373	-10.81	-0.3077	-10.32
Dinosaur National Monument	-0.5890	-9.05	-0.4281	-9.59
Popo Agie Wilderness Area	-0.3619	-9.08	-0.2254	-16.57
Savage Run Wilderness Area	-0.2901	-9.81	-0.1355	-9.84
Wind River Roadless Area	-0.3039	-8.00	-0.1439	-6.58
Gros Ventre Wilderness Area	-0.4639	-8.77	-0.2850	-9.08
Rocky Mountain National Park	-0.9541	-14.00	-0.3590	-8.63
Eagles Nest Wilderness Area	-0.2281	-10.72	-0.0872	-10.58
Flat Tops Wilderness Area	-0.5193	-13.39	-0.3127	-13.13

### Acid Neutralizing Capacity of Sensitive Lakes

Modeling results for cumulative sources indicated that there would be no ANC changes at any of the 19 analyzed lakes that exceed the 10-percent threshold or the  $\Delta\text{ANC} < 1 \mu\text{eq/L}$  threshold for the three extremely sensitive lakes. Lake ANC impacts are summarized in Section 4.6.3 of the AQTSD.

### 5.5.5 Climate Change Impacts

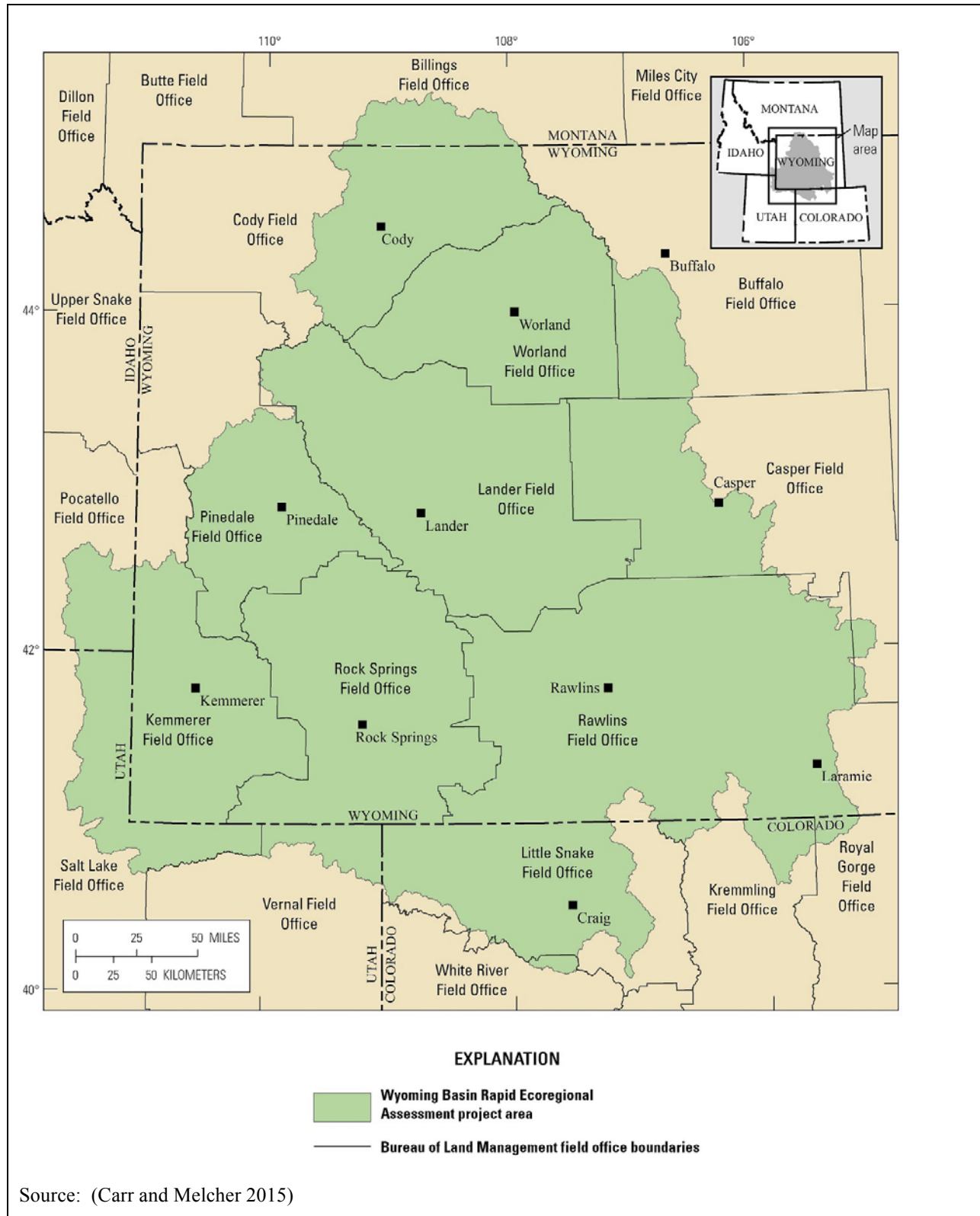
As discussed in sections 3.5 and 4.5 **Air Quality**, the current scientific consensus is that anthropogenic emissions of GHGs are causing the global climate system to warm, and the amount of GHGs emitted globally will determine the magnitude of climate change throughout this century (NCA 2014a). Forecasts of changes in the climate system under different GHG emissions scenarios are made with global climate models. In Wyoming, the number of hot days and warm nights is predicted to increase, leading to “increased demand for water and energy and impacts on agricultural practices.” (NCA 2014b)

The GHGs to be emitted by the Proposed Action and alternatives, and from other RFD projects in the study area, are carbon dioxide, methane, and nitrous oxide, all of which have atmospheric lifetimes on the order of years. Emissions of GHGs from any particular source become well-mixed throughout the global atmosphere. GHG emissions from all sources contribute to the global atmospheric burden of GHGs, and it is not possible to attribute a particular climate impact in any given region to GHG emissions from a particular source.

### Wyoming Basin Ecoregional Assessment

In recognizing the need for additional information to support planning and decision making over large geographic areas, the BLM has recently developed a Landscape Approach which includes the Rapid Ecoregional Assessment (REA) program. The overall goals of the REA are to identify important ecosystems and wildlife habitats at broad spatial scales; identify where these resources are at risk from development, wildfire, invasive species, and climate change; quantify cumulative effects of anthropogenic stressors as required under NEPA; and assess current levels of risk to ecological resources across a range of spatial scales and jurisdictional boundaries by assessing all lands within an ecoregion. A REA has been developed for the Wyoming Basin, which includes the cumulative impact analysis area for the CD-C Project (Carr and Melcher 2015). The Wyoming Basin REA project area, along with the BLM Field Office boundaries intersecting the REA project area, are shown in **Figure 5.5-1**.

## CHAPTER 5—CUMULATIVE IMPACTS



**Figure 5.5-1. The Wyoming Basin Rapid Ecoregional Assessment Project Area**

## CHAPTER 5—CUMULATIVE IMPACTS

As part of the Wyoming Basin REA a climate analysis was developed, which included a reasonably foreseeable range of projected changes in temperature, precipitation, and hydroclimate variables for the Wyoming Basin. The “reasonably foreseeable” concept is modeled after the same concept for “reasonably foreseeable development scenarios” required for BLM land-use planning and is intended to reflect a range of potential future conditions due to natural variability and uncertainty in the global climate models. Key points from the Wyoming Basin REA climate analysis are excerpted here:

- *Temperatures in the Wyoming Basin have warmed by almost 2°F in the past 30 years, which is statistically significant. In contrast, precipitation does not show a statistically significant trend compared to precipitation variability of the recent past.*
- *Based on the climate models evaluated for the REA, the Wyoming Basin is projected to warm by about 2.5°F, with a modeled range of 1.5–3.5°F by 2030. The projected increase in temperature is higher for the period ending in 2060, with an average increase of about 4.9°F and a range from 2.7–4.9°F.*
- *Projections indicate an increase in the minimum temperatures of the coldest days, and an increase in the frequency and temperature of the hottest days. Projected temperatures for 2060 indicate that summers may be as warm as or warmer than the hottest summers in the recent climate.*
- *Climate projections do not show a dramatic change in annual average precipitation. Historical variability in precipitation is high.*
- *Snow water equivalent on April 1 is projected to decrease by at least 20 percent or more by 2030 in many areas, although not in the higher mountains. Based on projections of earlier snowmelt and runoff, soil moisture has the potential to increase earlier in the spring and dry out earlier in the growing season.*
- *Paleoclimate reconstructions of streamflow show considerable variability in records within the last 500 years, including years-to-decades of wetter or drier conditions in reconstructed streamflows.*
- *The projected changes in temperature and shifts in precipitation and streamflow variables have implications for the Wyoming Basins ecosystems. These could include changes in elevation of climate zones, shifts in timing of peak streamflow, shifts in the seasonal pattern of soil moisture, and a longer growing season.*

## ■ BIOLOGICAL ENVIRONMENT

### 5.6 VEGETATION AND RIPARIAN/WETLAND COMMUNITIES

The CIAA for vegetation communities is the CD-C project area. Historic development in the project area accounts for 60,176 acres of initial disturbance and 17,663 acres of long-term disturbance. Added to this total, the Proposed Action and all Alternatives would disturb between 47,200 (Proposed Action) and 21,440 acres (Alternative E) in the short term (**Table 2.4-1**). The long-term disturbance would range from 18,861 to 8,567 acres. Due to the longer timeframe needed for shrub establishment, there would be an increase of acreage dominated by herbaceous vegetation versus that dominated by shrubs throughout the CD-C project area.

Factors impacting vegetation besides removal include the indirect impact of dust accumulation on vegetation, resulting in reduced photosynthetic activity and growth and lower palatability for herbivores. Additionally, the increase in invasive species in the project area has already affected the native vegetation and would continue to do so. Vegetation is also impacted by other existing uses such as livestock grazing, wildlife foraging, and wild horse grazing. These uses will continue into the future and as available vegetation is removed, competition among these species (especially on critical winter range) could further impact the vigor of the vegetation in those areas. Soil loss and compaction in areas of construction can also contribute to the difficulty of reclamation.

Wetlands and riparian communities are a very small component of the vegetation cover in the CD-C area. Protections are in place to protect these areas from physical impact, but those adjacent to gravel or dirt roads could be impacted by dust.

Impacts from the CD-C project would be additive to other actions within and near the CIAA. Roads within the project area are utilized to travel to adjacent projects such as the Atlantic Rim Natural Gas Field to the east and Desolation Flats to the west. Secondary roads may also be used to access the Luman Rim and Table Rock projects near the northwest and western borders of the project area. Additionally, three new transmission lines are proposed to cross the project area which would increase traffic during the planning, development, and operation/maintenance stages. This additional use of the gravel and dirt roads within the project area would contribute additional dust and the vehicles could transport seeds of noxious plant species both into and out of the project area. Additional surface disturbance would also occur as a result of construction of the new transmission lines, increasing the amount of surface acres to be reclaimed as well as the amount of permanent disturbance.

### 5.7 INVASIVE, NON-NATIVE SPECIES

The CIAA for invasive species is the CD-C project area and adjacent areas of development that could provide a seed source for invasive plants and also could provide sites for potential infestation by invasive species from the CD-C project area.

Impacts to vegetation and range resources would occur on all lands in the project area under the Proposed Action and all alternatives, due to an increase in surface disturbance which could provide more suitable habitat for invasive weed infestations.

Vehicles and equipment traveling from weed-infested areas, within and outside the project area, could facilitate the spread of invasive weeds into previously weed-free areas in addition to facilitating the spread of seeds of existing invasive populations. Surface-disturbing activities could increase the potential for infestation and spread of invasive plant species. Invasive weed species usually thrive on newly disturbed surfaces and out-compete more desirable native plant species. Creation of new sites for weed infestations may occur in proximity to roads where fugitive-dust deposition on roadside plants reduces

their density due to reduced photosynthetic activity and reduced vigor, thus providing a suitable habitat for invasive plants to establish.

In addition to the CD-C project, several other natural gas projects are located adjacent to the project area and could provide potential seed sources for establishment of invasive species in the project area. They include Atlantic Rim on the east of the project area, Desolation Flats on the southwest, Luman Rim on the northwest, and Table Rock and Monell Arch to the west. Additionally, three transmission-line projects are proposed to cross the project area and vehicles/equipment associated with the planning and construction of those projects provide other potential seed sources and seed vectors.

## **5.8 WILDLIFE**

The cumulative impact analysis areas (CIAAs) for wildlife resources differ with respect to species. This analysis examines the proportion of the wildlife habitat within respective CIAAs that may be disturbed from all past, present, and RFFAs. The combination of individual projects results in a large area potentially exposed to increased fragmentation, disturbance of wildlife and their habitats, disruption of migratory corridors, and the loss of refuge areas. Additional effects are expected on wildlife dispersal, the reduction of non-fragmented habitats, competition with livestock, and competition with other wildlife species. The generalized increase of human presence and associated disturbance across such a broad area are a concern. Remaining areas of intact habitat with increased competition for forage leading to reduced carrying capacity and juvenile survival can also be expected for some species. Mitigations, COAs, and other BMPs would reduce the impacts of these developments, but not eliminate them. Reduced populations and population viability can be expected in high-density development areas.

Cumulative indirect effects from the Proposed Action or alternatives and RFFAs to all wildlife species in general would come from road/traffic impacts, including vehicle collisions, noise, and dust. As roads are developed within and adjacent to the project area, habitat is fragmented. Roads can serve as barriers to some animal movement. The displacement of species away from roadsides can be reasonably predicted. Roads also provide access to the public into areas that were previously undisturbed/undeveloped. Human encroachment in the form of casual backcountry recreation, hunting, and poaching could occur at higher rates resulting in effects such as disturbance during sensitive periods, displacement, or increased mortality.

It is believed that many species avoid dust and noise from roads, which compounds impacts to adjacent habitats throughout the CIAA; therefore, displacement of wildlife species may occur in “busy” or “noisy” areas in the CD-C project area and the CIAA. Sagebrush-obligate species would be affected by the cumulative removal of habitat (reduction or fragmentation of patch size or vertical habitat structure) and the expanded road system throughout the area.

### **5.8.1 Big Game**

Disturbance during construction and production, such as human presence, dust, and noise may displace or preclude big game use during all seasons. Prohibiting construction, drilling, and other activities potentially disruptive to wildlife during sensitive time periods (e.g. winter) would minimize the probability of displacement during these critical times. The extent of displacement would be related to the duration, magnitude, and visual prominence of the activity, as well as the extent of construction and operational noise levels above existing background levels. Displacement would result in local reductions in wildlife populations if adjacent, undisturbed habitats are at carrying capacity. In this situation animals are either forced into less-optimal habitats or they compete with other animals that already occupy unaffected habitats. Possible consequences of such displacement are lower survival, lower reproductive success, lower recruitment, and ultimately lower carrying capacity and reduced populations (WGFD 2010a). Elk are not considered in this cumulative impact analysis as CWR for the species would not be impacted by the CD-C project.

Construction, such as building well pads and roads, reduces forage available to big game. The significance of this forage reduction is greater in big game CWR and associated migration corridors, especially as development cumulatively and concurrently occurs outside the project area in adjacent energy development areas. The application of seasonal restrictions intended to minimize CWR and migration corridor disturbance could serve to further concentrate big game in those refuge areas. These seasonal restrictions are not generally applied in state and private energy development areas. In addition, new gas field-related roads provide unconstrained access to the general public, which could result in increased human presence during sensitive periods such as winter. Recreational “antler hunting” has been identified by WGFD as an issue in CWR in some areas of the state. This activity is now restricted from January 1 to April 30 in the area loosely described as south of I-80 (**Map 5.8-1**).

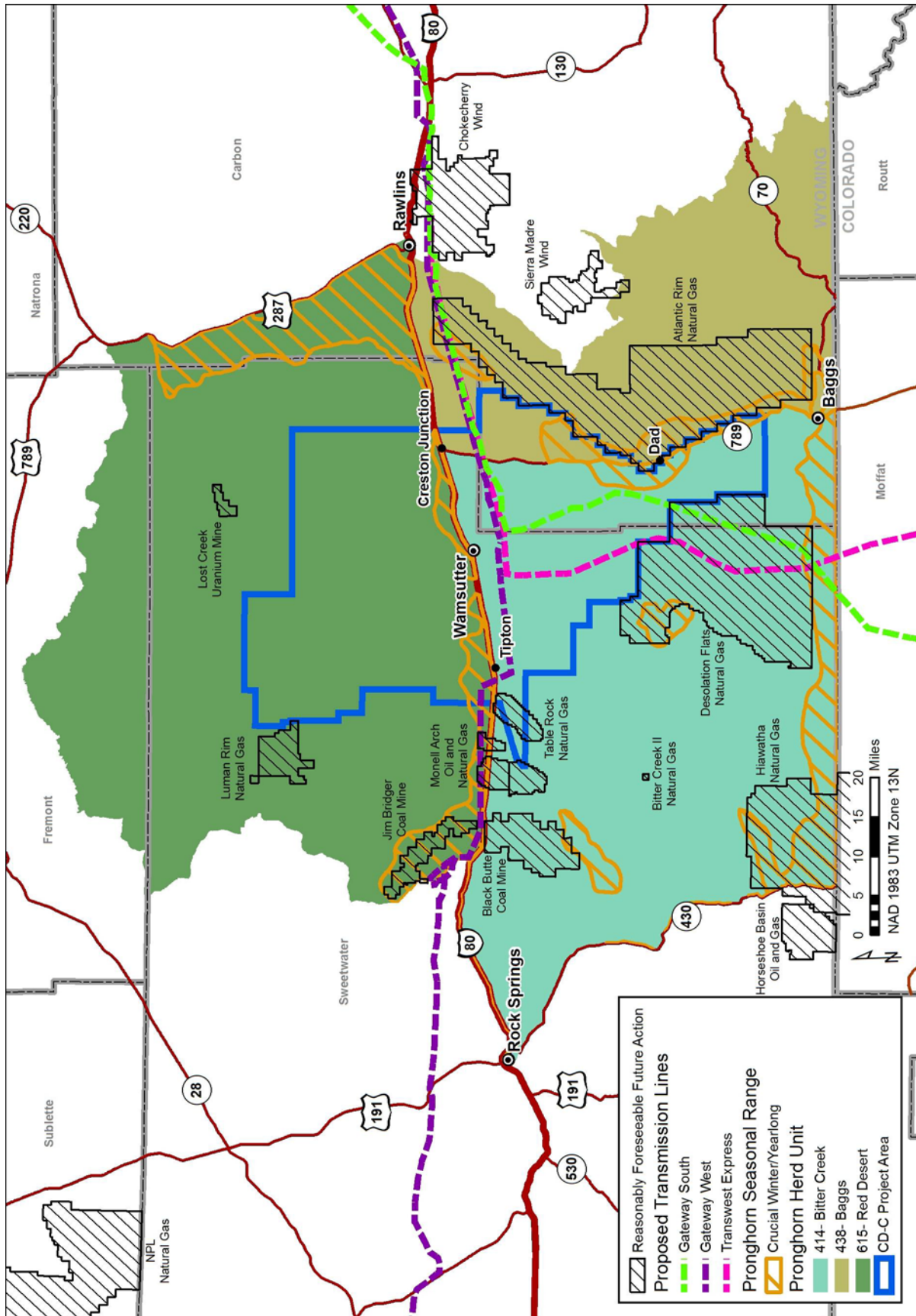
Big game populations are managed within Herd Units designated for each species and cumulative impacts are discussed in the context of these areas. Implementation of the proposed project would affect crucial winter/winter yearlong range and associated migration corridors for these species. The specific locations of future disturbances within the CD-C project area and the other RFFAs (**Section 5.0**) that fall within the Herd Units and crucial seasonal habitats are unknown; therefore, the exact location of each seasonal big game range or migration route that may be affected by development activity is unknown. The cumulative portion of each CD-C big game CWR and migration route that could be affected by the combination of existing, proposed, and RFFA disturbances for pronghorn and mule deer is discussed below. Cumulative impacts to big game would include permanent, short-term, and long-term loss of habitat, as well as increased stress due to human/wildlife encounters, potential reductions in birth/survival rates, and possible alterations of migration routes.

**Pronghorn.** The cumulative impact analysis area for pronghorn comprises the Herd Units impacted by the CD-C project (**Map 5.8-1**). Cumulative impacts to pronghorn migration routes are unknown at this time; however, the current fencing along WY 789 creates a barrier to pronghorn attempting to migrate across this highway. The WGFD has constructed highway underpasses along WY 789 in an effort to provide safe access during migration and reduce the frequency of vehicle collision; however, pronghorn do not appear to use these accommodations (WYDOT 2012, Gregson 2012). I-80 constitutes a significant barrier to pronghorn seasonal movements. Dependent on the severity of the winter, there are miles of rangeland fence that also create migration barriers for pronghorn.

It is assumed that most, if not all, of the Baggs herd transition range is located within the interface of the CD-C and Atlantic Rim project areas (BLM 2006a) along WY 789. Approximately 76 percent of the Baggs Herd Unit crucial winter/yearlong range could be affected by long-term development in the following areas: 30 percent within the CD-C project area, 42.6 percent within the Atlantic Rim project area, and 3.4 percent within new transmission line corridors as well as the CCSM wind project. Virtually all of the Baggs pronghorn crucial winter range lies within one or more oil and gas project boundary.

Approximately 44.5 percent of the Bitter Creek Herd Unit CWR is located within the project area for the Proposed Action and other RFFAs including Hiawatha (22.7 percent), existing CD-C (10 percent), Desolation Flats (6.5 percent), and new transmission line corridors (3 percent), other existing oil and gas development actions, as well as WY 789. The CD-C project, new transmission line corridors, Jim Bridger Coal, and other energy developments, as well as I-80, could affect approximately 19 percent of the Red Desert Herd Unit CWR. It is anticipated that the CWR in the Red Desert Herd Unit would also be affected by scattered oil and gas development activities and US 287





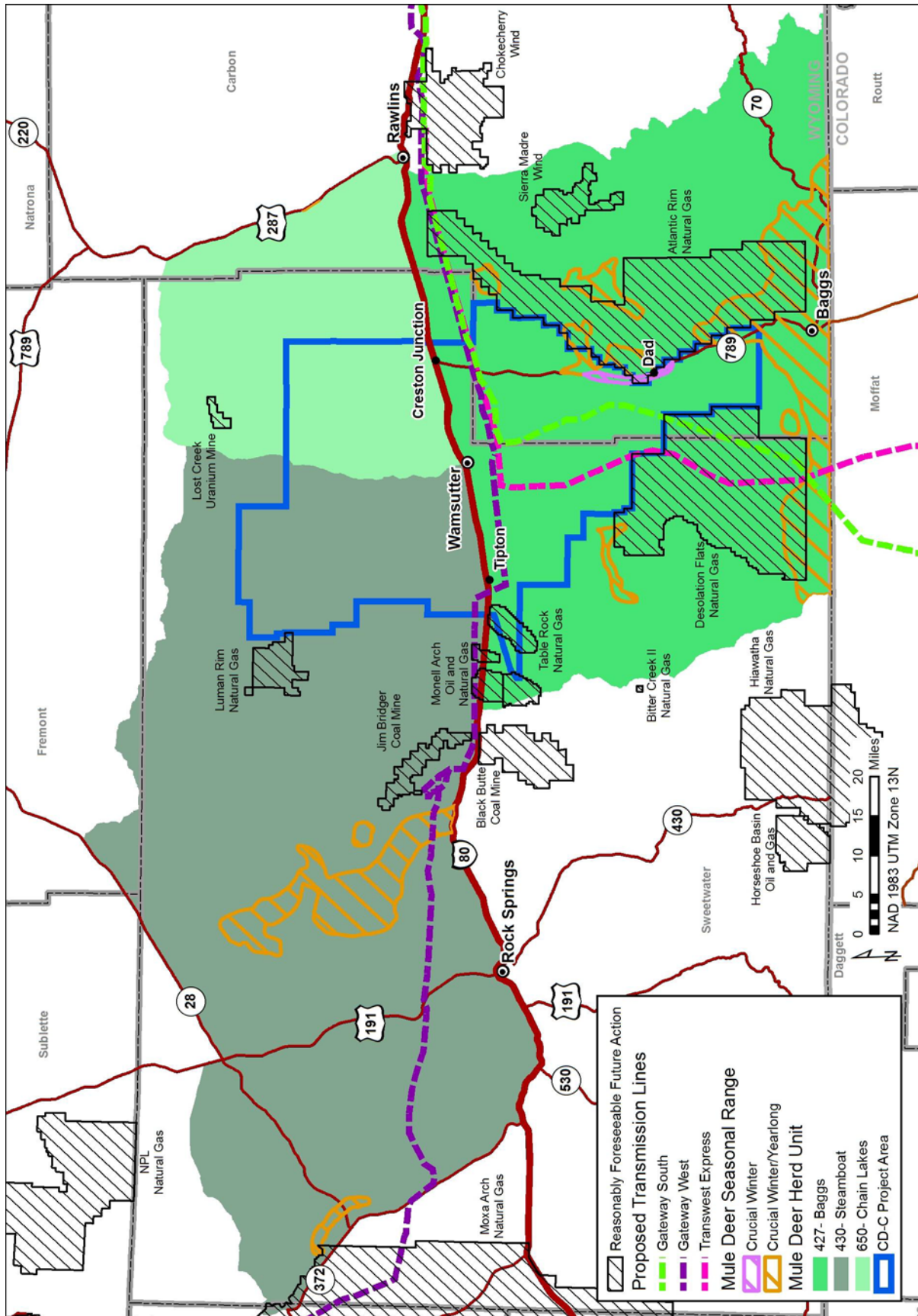
No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

**Mule deer.** The cumulative impact analysis area for mule deer comprises the Herd Units impacted by the CD-C project (**Map 5.8-2**). Cumulative impacts upon mule deer migration routes within the Baggs Herd Unit are unknown; however, WGFD and the Wyoming Department of Transportation have constructed highway underpasses along WY 789 in an effort to provide safe access during migration and reduce the frequency of vehicle collision. Mule deer are successfully using these underpasses (WYDOT 2012, Gregson 2012).

As with pronghorn, it is assumed that most, if not all, of this herd's transition range is located within the interface of CD-C and Atlantic Rim project areas (BLM 2006a) along WY 789, and possibly in the CCSM area. Approximately 6 percent of the Baggs Herd Unit crucial winter/year-long range could be affected by long-term development within the CD-C project area, another 26 percent falls within the Atlantic Rim project area, 7 percent would be affected by the Desolation Flats project, and approximately 4 percent is located within 0.5 mile of proposed new transmission-line corridors. Over 44 percent of the Baggs mule deer CWR may lie within one or more reasonably foreseeable oil and gas project or transmission line corridor. As discussed in **Section 4.8.3.1**, predictive maps suggest some habitats considered "high probability of use" areas prior to development would change to "low probability of use" areas as development progresses. These impacts would be increased as the CD-C, Atlantic Rim, and Desolation Flats projects are developed. Approximately 31 acres of mule deer CWR are identified in the Chain Lakes Herd Unit, none of which would be affected by the CD-C project or other RFFAs. None of the CWR in the Steamboat Herd Unit would be affected by the CD-C project; approximately 2 percent could be influenced by new transmission line corridors.

**Overlapping big game crucial winter ranges** are located at the interface of the CD-C project area and the Atlantic Rim project area along WY 789 (**Map 3.8-7**). As discussed above, this area is expected to see additional development and production activity resulting in additional stress and displacement of pronghorn and mule deer, as well as reduced winter forage as a result of increased surface disturbance. Impacts to these herds would be exacerbated by the current fair to poor condition of forage in crucial winter habitat designated areas (see **Section 4.8.3.1**). Over the long term, the impacts anticipated from the CD-C project and RFFAs would be similar for the various CD-C project area development alternatives with the exception of Alternative D which would reduce total surface disturbance, and associated shrub habitats, by approximately 29 percent, when compared to the Proposed Action. Alternative B (Enhanced Resource Protection), Alternative C (Surface Disturbance Cap with High and Low Density Development Areas) and Alternative F (Agency Preferred Alternative) would provide protection to big game CWR areas over the life of the project. Alternative B provides a variety of impact thresholds, each of which enhances the mitigation and protection for wildlife species and their respective critical seasonal ranges. BLM seasonal restrictions and those enhancements provided under Alternative B are not generally applied in state and private energy development areas. Regardless of the Alternative selected, existing impacts to the CD-C pronghorn and mule deer herds is already at a "High Impact" or significant level; the level of impact will increase under all Alternatives.

An indirect impact of these CIAA actions includes unrestricted access by the general public using gas field-related roads, which could result in increased human presence in CWR during sensitive periods. Recreational "antler hunting" has been identified by WGFD as an issue in CWR in some areas of the state. This activity is now restricted from January 1 to April 30 in the area loosely described as south of I-80 (**Map 5.8-2**).



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### 5.8.2 Raptors, Small Mammals, Upland Game Birds, and Neotropical Songbirds

The CIAA for raptors includes the CD-C project area plus a 1-mile buffer (**Map 5.8-3**). This area covers approximately 1,226,825 acres, all of which would be considered raptor foraging habitat. Approximately 939 nests are known to occur in the CIAA; 780 known nests (83 percent) are within the project area, 122 nest sites are located in the CIAA of overlap between Atlantic Rim and CD-C project area, 14 would possibly be affected by transmission lines, and another 14 lie in the overlap area between Desolation Flats and the CD-C project area. Approximately 61 percent of the known nests are ferruginous hawk, 10 percent are golden eagle, and 5 percent are red-tailed hawk; the remaining 25 percent are various species including burrowing owl, prairie falcon, and American kestrel.

Because the Proposed Action (**Section 4.8.3.1**), Alternatives B through D and Alternative F require buffers and restrictions on activity around active raptor nests and because most of the prey utilize habitat that can be reclaimed in a timely fashion, the impacts on most raptor species in the CD-C project area and associated RFFA overlap areas are not expected to exceed the significance criteria. The BLM timing stipulations for protection of raptor nests are not applied on state and private energy development actions; however, by precluding new development on federal surface and mineral estate except on a case-by-case basis Alternative E provides protection to these species. Refer to **Section 5.9.3** for a discussion of CIAA for the ferruginous hawk.

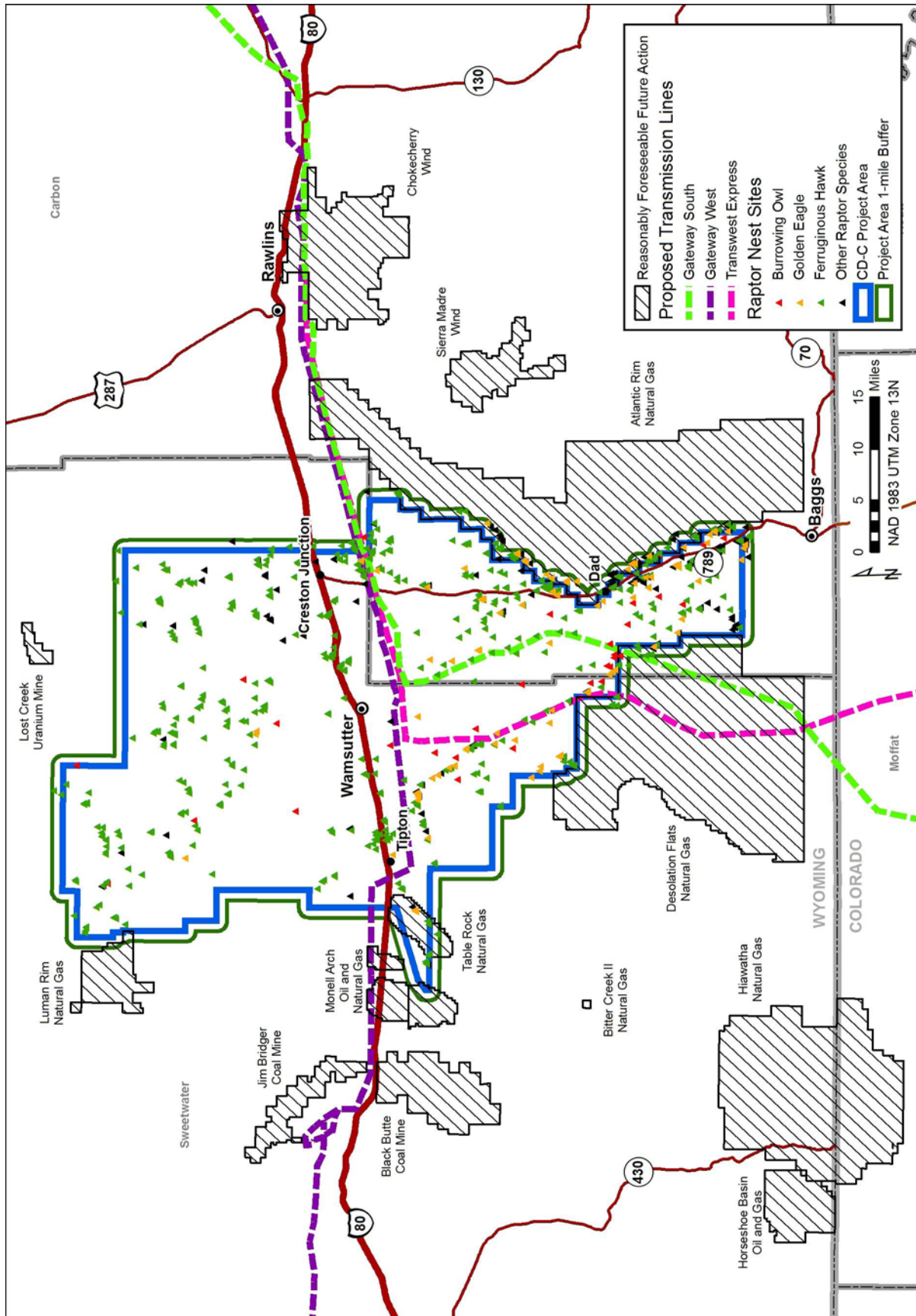
For small mammals and neotropical songbirds, the impacts anticipated from the Proposed Action, Alternatives, and RFFAs would be similar. The Proposed Action and the action alternatives provide a variety of mitigations and protections for various wildlife species. Alternative B, with enhanced mitigations and protections, would enhance habitat for prey and grassland species. Alternative D, with required directional drilling on federal mineral estate, would reduce surface disturbance and associated shrub habitat removal by about 29 percent when compared to the Proposed Action. Although the MBTA and BLM IM protections, where applicable, apply to all alternatives and RFFAs, sagebrush obligate species would experience an overall reduction in suitable habitat for the life of the various projects within the CIAA.

### 5.8.3 Fish

Cumulative impacts to fish species would include the effects of the CD-C project and other developments upstream in Muddy Creek, the most notable of which are the Atlantic Rim Natural Gas Project, the Desolation Flats Natural Gas Project and the CCSM.

About 10 game-fish species and 20 non-game fish species may occur within or upstream/downstream from these projects. Of these, about 14 species, including six native species, are likely to be present within the project areas. Of the 14, four are BLM Sensitive Species and 10 are not. All of the 10 species that are not BLM Sensitive would be subject to the same types of impacts described in **Section 4.9.3.1. Sensitive Fish Species**; however, they have a wide distribution within Wyoming (Baxter and Stone 1995). Consequently, these projects and other human activities within the Muddy Creek and Great Basin watersheds may have localized population impacts, but these impacts would not be expected to impact their status range-wide.





No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

## 5.9 SPECIAL STATUS PLANT, WILDLIFE, AND FISH SPECIES

The CIAAs for wildlife resources differ with respect to species. The combination of the individual projects could result in a large area of increased fragmentation, disturbance of wildlife and their habitats, disruption of migratory corridors, and the loss of refuge areas. Additional effects could be wildlife dispersal, increase in fragmented habitat, competition with livestock, and inter-specific competition. The generalized increase in human presence and associated disturbance across such a broad scale are a concern. It is believed that many species avoid dust and noise from roads, which compounds impacts to adjacent habitats throughout the CIAA; therefore, displacement of Special Status wildlife species may occur in “busy” or “noisy” areas in the CD-C project area and the CIAA. It can also be expected that competition for forage would increase in the remaining habitats leading to reduced carrying capacity and juvenile survival for some species; see **Section 4.9.3** for a more detailed discussion of potential impacts to Special Status Species. Mitigations, COAs, and other BMPs would reduce the impacts of these developments, but not eliminate them. Reduced populations and population viability for some species can be expected in high-density development areas. However, the BLM mitigations, COAs, BMPs etc., are not generally applied on state and private energy development actions.

### 5.9.1 Threatened, Endangered, Proposed, or Candidate Wildlife Species

**Canada lynx.** The cumulative impacts analysis area for the Canada lynx includes the project areas for the CD-C and adjacent RFFD’s, specifically Atlantic Rim and Desolation Flats. The presence of Canada lynx in the CIAA is very unlikely (see **Section 3.9.1.1**). Disturbance to riparian corridors, which could be used as travel corridors by transient lynx, would be limited by application of protective setbacks on projects with a federal nexus. There are limited riparian systems within and adjacent to the CD-C project area (**Map 3.4-2**). Atlantic Rim borders the southern portion of CD-C to the east, while Desolation Flats lies to the west. Both of these projects are dominated by federal minerals and surface estate, as is CD-C, thus applying the BLM setback mitigation measures to Muddy Creek and its tributaries. That said, as with CD-C, these projects also include large percentages of state and private mineral estate which would not be required to implement the BLM riparian setback or Muddy Creek protections, possibly resulting in riparian corridor disturbance. Regardless, the possibility of lynx traveling through the area and being impacted is negligible. Therefore, the CD-C project area and RFFA’s are not expected to exceed the impact significance criteria for the Canada lynx.

### 5.9.2 Threatened and Endangered Fish Species

Cumulative impacts to Threatened and Endangered fish species would include the effects of the CD-C project and other developments upstream in Muddy Creek, of which the most notable are the Atlantic Rim Natural Gas Project and the CCSM.

Four federally endangered fish species may occur as downstream residents of the Colorado River system: **Colorado pikeminnow** (*Ptychocheilus lucius*), **bonytail** (*Gila elegans*), **humpback chub** (*Gila cypha*), and **razorback sucker** (*Xyrauchen texanus*) (USFWS 2003). Suitable habitat for these species exists downstream of these developments in the Little Snake, Yampa, and Green Rivers. Because the Colorado pikeminnow is found in the Little Snake River, it could migrate into Muddy Creek. Muddy Creek, however, is not suitable habitat for this species. Though they currently exist only downstream of the project area, water draining from the project area affects the downstream habitat for these species. Sources of potential risks to these fish species are water depletions, discharges of produced water, and spills of toxic materials.

**Water Depletions.** Under the RIP for Endangered Fish Species in the Upper Colorado River Basin, “any water depletions from tributary waters within the Colorado River drainage are considered as jeopardizing the continued existence of these fish.” A small amount of water depletion (10.3 ac-ft per year) would occur for the Atlantic Rim Natural Gas Project, and the CD-C project may deplete up to 650 ac-ft of water

per year from aquifers in the Wasatch formation that may have contact with and contribute to the Little Snake River and its tributaries, including Muddy Creek. After reviewing the current status of the Endangered Fish Species in the Upper Colorado River Basin and the effects of the project, including the cumulative effects, the USFWS concluded that “the Project is not likely to jeopardize the continued existence of endangered fish and is not likely to destroy or adversely modify designated critical habitat” (USFWS 2014).

**Discharges of Produced Water and Spills of Toxic Chemicals.** Produced water from activities authorized in the CD-C and Atlantic Rim project RODs would not be discharged to Muddy Creek within the Little Snake River drainage; therefore, produced-water discharges from these activities would not pose a potential risk to these species. However, produced water could be discharged from drilling activities within the CD-C project area that may be authorized after separate, future NEPA analyses. Those analyses would determine the risk to species in the Little Snake and Muddy Creek drainages. Any toxic chemicals in accidental spills to Muddy Creek would be diluted to a point of insignificance, greatly reducing their potential toxicity to fish

### 5.9.3 Threatened and Endangered Plant Species

The CIAA for Threatened and Endangered Plants is the CD-C project area. As described in **Section 4.9.3**, direct impacts to the threatened Ute ladies’-tresses (*Spiranthes diluvialis*) are not anticipated to occur because of their absence within the CD-C project area. The application of the 500-foot buffer for riparian areas would provide protection for this species if future surveys were to locate any plants. If suitable habitat (i.e. riparian areas) were present, the proposal would be modified so impacts were avoided. The BLM stipulation for avoidance of riparian areas is not applied to state and private energy development actions.

### 5.9.4 Sensitive Wildlife Species

Chapter 4 analyses determined that implementation of the Proposed Action or other alternatives is not expected to exceed the impact significance criteria for pygmy rabbit, swift fox, white-tailed prairie dog, Wyoming pocket gopher, bald eagle, ferruginous hawk, burrowing owl, sagebrush obligate avian species, or mountain plover with the caveat that BLM mitigation measures be applied regardless of alternative selected. In addition, Alternative B provides enhanced protections for: ferruginous hawk nesting habitat. Alternative D reduces surface-disturbing activity by almost 29 percent compared to the Proposed Action.

The caveat regarding application of BLM mitigation measures for Special Status Species would apply to all RFFAs as well as the CD-C project but would not apply to privately-owned checkerboard lands or state or private mineral estate in the CIAA, unless BLM surface were involved. While some disturbance of these species would likely occur on private lands, it is not expected that impact significance criteria would be exceeded.

#### 5.9.4.1 Ferruginous hawk

Concerns are identified (**Section 4.9.3**) regarding potential impacts to ferruginous hawk from disturbance to nesting/foraging habitats. The CIAA for raptors includes the CD-C project area plus a 1-mile buffer (see **Map 5.8-3**). This area covers approximately 1,226,825 acres, all of which would be considered raptor foraging habitat. Approximately 577 ferruginous hawk nests are known to occur in the buffered CD-C project area. An undetermined number of active nest sites would not be protected by application of the BLM timing stipulation and 1-mile buffer on state and private lands/minerals, especially in the “checkerboard.” Overall, because of the required buffers and restrictions on activity around raptor nests and because of the fact that most of the prey utilize habitat that can be reclaimed in a timely fashion, the impact on ferruginous hawks in the project area and associated RFFA overlap areas is not expected to exceed the significance criteria. Although the CCSM does not overlap the one-mile CIAA for CD-C

relative to the ferruginous hawk, there is a possibility that individuals of the species would be displaced from there to suitable and available habitat in CD-C and other RFFAs, such as Atlantic Rim.

#### 5.9.4.2 Greater Sage-Grouse

The cumulative impacts analysis for the Greater Sage-Grouse is provided at two scales, using two CIAAs. First, the regional scale addresses the broad landscape scale impact, demonstrating the long-term (30 years) outcomes for the species across the Western Association of Fish and Wildlife Agencies (WAFWA) Management Zones (MZ) most likely to be impacted by oil and gas activity in the Rocky Mountain portion of the range of the species. The second CIAA is based on the CD-C project and nearby existing and reasonably foreseeable energy development activities.

#### Regional Cumulative Impacts

The BLM and the Forest Service conducted a region-wide cumulative impact assessment of the activities and development that could affect Greater Sage-Grouse habitat in the EIS for Resource Management Plan Amendments for six BLM Wyoming field offices and the Land Use Plans (LUPs) for three national forests in Wyoming (BLM 2015a). The CIAA included Greater Sage-Grouse MZs II and VII, which span five states. Within this expansive area, oil and gas development influences up to 78 percent of Priority Habitat Management Areas (PHMAs) and BLM-administered lands account for 54 percent of wells in PHMAs (BLM 2015a). All past, present and reasonably foreseeable future actions within the CIAA including, but not limited to, oil and gas development, infrastructure, wind energy development, and livestock grazing, were considered. The CD-C project is included in this CIAA. MZ II comprises the Wyoming Basin population and includes portions of Wyoming, Montana, Idaho, Utah and Colorado.

The analysis considers the management and conservation strategies promulgated not only by the BLM and the Forest Service but by the affected states as well. Management strategies considered included those covering all identified Greater Sage-Grouse habitats, the PHMAs (including Sagebrush Focal Areas, or SFAs), and the General Habitat Management Areas (GHMAs). The Southwestern Wyoming and the Uinta–Piceance geological basins are both located partly in MZs II and VII, and coincide with high-density areas of Greater Sage-Grouse, large numbers of leks, and the highest male attendance at leks compared with any areas in the eastern part of the range (USFWS 2010).

The analysis provides the following conclusion regarding the effectiveness of the various conservation strategies to be implemented in MZs II and VII: “Infrastructure and energy development are of particular concern in MZ II/VII because they affect the greatest land area. Numerous multi-state transmission lines are proposed through Greater Sage-Grouse habitat, as are large-scale oil and gas field developments in excess of 100,000 acres. Implementation of the Proposed LUPs in MZ II/VII is unlikely to preclude such projects from proceeding, especially Presidential priority transmission line projects that are not subject to Greater Sage-Grouse protective measures in the BLM and/or Forest Service Proposed LUPs; however, Greater Sage-Grouse protective measures are being considered in the project specific analysis. The cumulative effect of the conservation measures in the proposed LUP Amendments [including the Wyoming ARMPA] would result in protection of Greater Sage-Grouse populations. In some localized areas, small populations may be at continued risk due to the cumulative effect of reasonably foreseeable future infrastructure and energy development projects over the next 20 years, when combined with unplanned events such as wildfires, drought, or West Nile virus outbreaks. However, the LUP Amendments area-wide restrictions on land use, in combination with project-specific BMPs and RDFs and other regional efforts would achieve an overall net conservation gain for the regional population and would help mitigate the effects on small, at risk populations.”

#### Local Cumulative Impacts

An 11-mile buffer around the project boundary delineates the local CIAA for Greater Sage-Grouse (**Map 5.9-1**). This CIAA was used because research indicates that “an evaluation of habitats and sage-grouse populations that attend leks within an 11-mile radius from the project boundary in the context of ‘large’



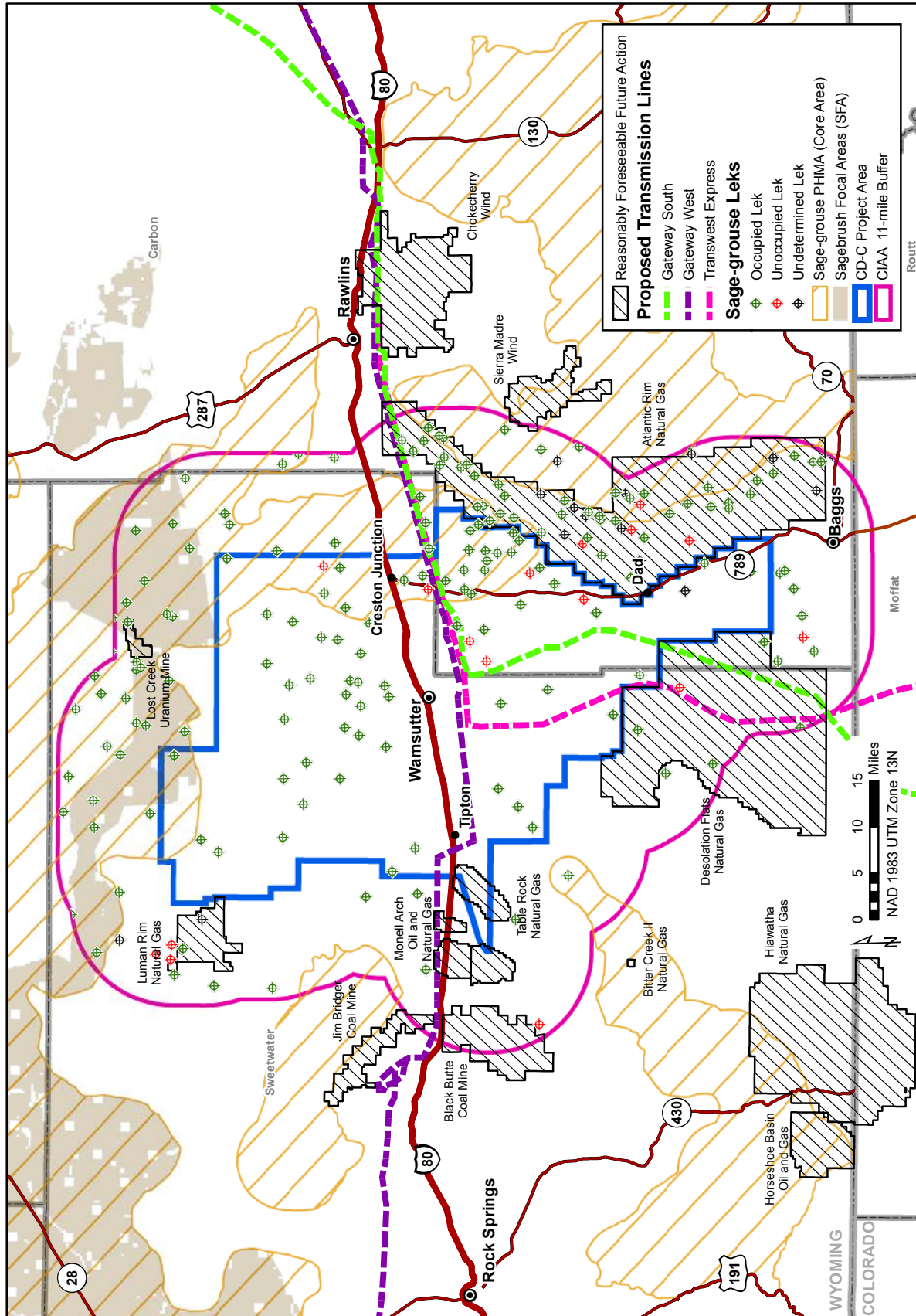
projects may be appropriate in order to consider all seasonal habitats that may be affected for birds that use the habitats associated with the proposal during some portion of the life-cycle of seasonally migratory sage- grouse.” (IM WY-2012-19, BLM 2012c)

The area includes the Luman Rim, Desolation Flats, Monell Arch, Table Rock, and Atlantic Rim natural gas projects as well as the Lost Creek Uranium Mine, the three proposed transmission lines, and a very small portion of the CCSM wind project. This area encompasses portions of the South Rawlins, Greater South Pass, Continental Divide, and Salt Wells Core Population Areas (SGEO 2015). Of these, only the Greater South Pass and South Rawlins Core Population Areas would be directly affected by the CD-C project or RFFAs.

Greater Sage-Grouse inhabit the CD-C project area and surrounding area year-round and require a wide range of seasonal habitats. A total of 201 known leks are located in or within 11 miles of the CD-C project area; 171 are occupied, 16 are unoccupied, and 14 have undetermined status (WGFD 2015, **Map 5.9-1.**) All 201 leks would potentially be affected by the CD-C project or RFFAs within the CIAA: 72 would possibly be directly affected by the CD-C project, 56 by Atlantic Rim, 17 by transmission line corridors and another 8 by various oil and gas projects. Other areas within the 11-mile buffer and associated PHMAs would be affected by scattered energy developments and various anthropogenic features on the landscape, which include but are not limited to livestock grazing and the CCSM wind project. The majority of these RFFAs are permitted using the standard COAs and BMPs found in **Appendix C, Conservation and Mitigation Measures**. As future, site-specific elements of these projects occur, protections found in the ARMPA may be applied.

The area of highest Sage-Grouse lek concentration in the 11-mile CIAA falls to the south of I-80 and east of WY 789, along the interface of the CD-C and Atlantic Rim projects. Approximately 70 occupied leks are known to be located in this area of high-quality/high-potential nesting and brood-rearing habitat (Dzialak *et al.* 2013a). This area also contains large expanses of high-quality/high-potential severe winter use habitat (Dzialak *et al.* 2013b).

Over half the CD-C CIAA is comprised of sagebrush and other shrub species, which represents potential Greater Sage-Grouse nesting and early brood rearing habitat. Recovery of shrubs in locations that have been disturbed by development to pre-disturbance levels is not expected to occur during the life of the project. Therefore, even locations that would be considered successfully reclaimed would represent a long-term loss of nesting habitat. However, these areas would be used as early brood-rearing and foraging habitats throughout the seral stages.



Map 5.9-1. Cumulative impact analysis area, Greater Sage-Grouse (with 11-mile buffer)

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

Development activity in GHMA may result in bird displacement and nest abandonment from direct and indirect impacts such as long-term habitat fragmentation; loss of nesting or brood-rearing habitat; displacement or additional stress due to increased human activities including increased vehicle traffic, dust, and excessive noise levels proximal to occupied leks; removal or modification of winter habitats; and increased predation due to an increased number of roosting sites available for raptors on power poles, tanks, and other man-made structures (see **Section 4.9.3**), especially in high-density development areas.

Within PHMAs (Core), application on federal, state, and private lands throughout the CIAA of the BLM ARMPA and SGEO Core Area density and disturbance limitations and mitigations (BLM 2015b, SWEO 2015) would reduce disturbance to the habitat and the species to the point that Sage-Grouse populations would not be negatively impacted. This would be true regardless of the alternative selected. Alternative D (100-Percent Directional Drilling) would reduce surface disturbance from road and well site locations by about 29 percent compared to the Proposed Action. Alternative E would result in less development than any of the other alternatives, reducing surface disturbance and impacts on Sage-Grouse habitat and populations within the CD-C project area by over 54 percent. Application of ARMPA decisions regarding SFAs would ensure that grazing and development under the General Mining Act of 1872 did not contribute further to the degradation of sagebrush within PHMAs. The Gateway South, Gateway West and TransWest Express transmission lines are located in the approved ARMPA corridor through the PHMAs. They are currently under NEPA review by the BLM, which would develop mitigation measures for these projects.

In the GHMA, application of the requirements of the ARMPA and SGEO for seasonal avoidance of potential nesting and brood-rearing habitat would reduce the potential impact to Sage-Grouse from federally permitted actions and state agency permitted activities on state and private lands but impact to those populations would still be anticipated under all alternatives. Impacts of Alternative B would be similar to the Proposed Action. Under Alternative C, the disturbance cap would place a limit on the amount of unreclaimed surface at any one time in a section of public land. Alternative D (required directional drilling on federal mineral estate) would reduce surface disturbance from road and well-site locations by about 29 percent compared to the Proposed Action. Alternative E (No Action) would limit CD-C development activities to individually permitted federal activities and private and state mineral estates, thereby limiting additional impacts to project area Sage-Grouse habitat and populations. Alternative F would result in non-core impacts similar to the Proposed Action.

The development of the CD-C project and other RFFAs in the CIAA would be done in accordance with the ARMPA and the SGEO and those strategies have been found to provide sufficient regulatory mechanisms for the conservation of Greater Sage-Grouse. Significant impacts to the regional population produced by these projects would not occur.

### 5.9.5 Sensitive Fish Species

Cumulative impacts to sensitive fish species would include the effects of the CD-C project and other developments upstream in Muddy Creek, of which the most notable are the Atlantic Rim Natural Gas Project and the CCSM.

Sensitive fish, described in **Section 4.9**, would be significantly impacted by both the CD-C and Atlantic Rim projects (Criteria 3 and 4). The types of impacts resulting from both projects would be similar and cumulative in their effects. The primary cause of impacts would be increases in suspended sediments and sedimentation, as well as increased selenium. Other industrial activities in the CIAA would impact surface-water quality in localized areas within the cumulative impact area. Construction of the CCSM could increase sediment in the upper reaches of Muddy Creek. The proposed Gateway South and TransWest Express transmission line projects would cross the Muddy Creek watershed and would have the potential to affect surface water during construction, operation, and decommissioning of the projects, particularly where the transmission corridors cross drainages.

Impoundments downstream of the CD-C project may be blocking sensitive fish movement into Muddy Creek, but are not attributable to these projects. As detailed in Chapter 4, additional impoundments and alterations to natural flow characteristics (such as crossings) within Muddy Creek could have serious additional impacts to fish populations. Alteration of hydrology from roads, culverts, and other disturbances that result in re-channeling of overland flows into new channels or increasing the intensity/volume of flows within existing channels can affect sensitive fish. Blockage of fish migration within and upstream of the CD-C project area as a result of channel crossings would seriously impact the viability of fish populations if it should occur.

Alternative B (Enhanced Resource Protection) and Alternative F (Agency Preferred Alternative) should reduce project impacts to sensitive fish species because of an expansion of the area in which surface disturbance would not occur (Alternative B) and provisions for more intensive soil and water management (Alternative F). However, these provisions would only apply to BLM-administered land (an estimated 48 percent of the watersheds), diminishing their effectiveness within the entire watershed.

Produced water from activities authorized in the CD-C or the Atlantic Rim project RODs would not be discharged to Muddy Creek; therefore, produced-water discharges from these activities would not pose a risk to fish. However, produced water could be discharged from drilling activities within the CD-C project area that may be authorized after separate, future NEPA analyses. Those analyses would determine the risk to species in the Little Snake and Muddy Creek drainages. Accidental releases of toxic materials to Muddy Creek from any of the projects in the Muddy Creek watershed would pose a risk to sensitive fish populations. The probability of spills occurring is unknown but probably low because of measures such as SPCC plans. However, the consequences of a spill could be severe, given the toxicity of some of the chemicals involved.

### 5.9.6 Sensitive Plant Species

The CIAA for sensitive plants is the CD-C project area. As described in **Section 4.9.3**, direct impacts to sensitive plant species on federal land are unlikely to occur because the potential presence of these species would be determined by soils survey or rare-plant surveys prior to site development. Management practices identified on a case-by-case basis would be applied to surface-disturbing activities to maintain or enhance Special Status Plant Species and their habitats (BLM 2008b, p. 2-47). Indirect impacts include dust affecting plant health and reproduction and invasive species being introduced in the adjacent habitat and competing with the sensitive plants.

Adjacent projects that could increase the dust and invasive species problem within the CD-C project area include Atlantic Rim on the east of the project area, Desolation Flats on the southwest, and Luman Rim on the northwest. Additionally, three transmission-line projects are proposed to cross the project area and vehicles/equipment associated with the planning and construction of those projects would provide other potential sources of dust and seed. The only sensitive plant that might be encountered during transmission-line construction is the Gibben's beardtongue. The surveys mentioned above should ensure that these plants, if encountered, would be avoided. The protections applied to sensitive species plants relative to BLM actions are not applicable to state and private energy development actions.

### 5.10 WILD HORSES

The CIAA for wild horses includes the Lost Creek and Adobe Creek Herd Management Areas (HMAs). Impacts to wild horses associated with the CD-C project would include disturbed land and associated loss of available forage along with dust affecting forage palatability. There is also the potential for horse/vehicle collisions.

The Adobe Town HMA is generally located within the Desolation Flats Natural Gas Project area and impacts to the herd are more likely to happen in that area than in the CD-C project area. Two of the

proposed transmission lines have potential routes through the Adobe Town HMA. During planning and construction, increased activity along their alignments would increase chances for collisions and generation of dust and remove forage at the tower sites.

The Lost Creek HMA is located in the northwestern portion of the CD-C project area. It continues north from the CD-C boundary. The Luman Rim field is located to the west of the HMA and effects from vehicles accessing that field through the CD-C are possible. The Lost Creek HMA may also receive impacts from traffic associated with the Lost Creek Uranium Project.

## ■ HUMAN ENVIRONMENT

### 5.11 VISUAL RESOURCES

The CIAA for visual resources is the CD-C project area. Comprising roughly 1.1 million acres, 40 percent of the project area is managed as VRM Class IV, where major modifications of the landscape would be allowed; the other 60 percent of the project area is managed as VRM Class III. As described in **Section 4.11.2**, the RFO manages VRM Class III land for moderate change to visual resources by mitigating impacts through the use of BMPs and COAs to APDs and Terms and Conditions for right-of-way permits. The extensive road network within the project area provides foreground and middle ground views of any Class III areas that would be developed.

Reasonably foreseeable actions that could affect VRM Class III landscapes in the CD-C project area are existing and ongoing oil and gas development and proposed electrical transmission line systems and rights-of-way. Development of the CD-C project on BLM land, combined with the same or similar actions on state and private land, would result in cumulative visual impacts. Cumulative impacts would be more likely to occur in the checkerboard and other areas of mixed ownership because the BLM does not have the jurisdiction to mitigate the actions on state and private mineral estate.

#### Cumulative impacts due to oil and gas development

Cumulative impacts due to oil and gas development would occur within the CIAA because of prior development and the infill development of the CD-C project. The only current oil and gas development listed in **Table 5.0-1** to overlap the CIAA is the Table Rock Oil and Gas Project.

Consistent with the analysis in Chapter 4, the greatest potential for cumulative impacts to visual resources from oil and gas development in the CIAA would occur under the Proposed Action, which would allow the highest level of surface disturbance. Alternative E, No Action, would cause the least amount of surface disturbance (as described in **Section 4.11.3.6**) because most development would occur on private and state mineral estate. Combined with past and ongoing oil and gas development, total disturbance would range from a high of 107,376 acres to a low of 81,816 acres. The cumulative visual impact of prior and ongoing development has been expressed in the BLM's classification of all of the area as VRM Class III or Class IV based on the Visual Resources Inventory (VRI).

#### Cumulative impacts due to transmission lines

Two of the electrical transmission line projects listed in **Table 5.0-1** would cross VRM Class III landscapes in the CD-C project area: the Gateway South Transmission Line Project (Gateway South) and the TransWest Express 600kV Project (TransWest). A third reasonably foreseeable transmission line, Gateway West, would cross VRM Class IV landscapes. Gateway South and TransWest are extended corridors that potentially would cross many viewsheds as they traverse the CD-C project area. The three reasonably foreseeable transmission line projects are illustrated in **Figure 5.0-1**.

The Rawlins RMP (BLM 2008b) has provided for future utility development by designating the routes of existing transportation and utility lines as corridors that would be suitable for new transportation and utility right-of-way systems (ROD Map 2-2). The RMP also recommends the exclusion from these

designated corridors of incompatible uses, among which are range and wildlife habitat improvements and any facilities “that would attract public use” (ROD p. 2-17). As they are shown on **Figure 5.0-1**, the alternatives for the proposed Gateway South and TransWest fall within designated corridors identified by the Rawlins RMP (ROD Map 2-2).

The impact of the Gateway South and TransWest projects would likely be greatest where the utility right-of-way crosses or parallels travel routes. As shown on **Figure 5.0-1**, the southern extent of the westernmost route alternative of the two transmission lines would cross interior BLM roads and the corridors of two historic trails, the Overland Trail and the Cherokee Trail. At those crossings, the transmission lines would adversely affect the viewshed of the roads and historic trails. Although the historic trail corridors are designated as “avoidance areas” for linear utility systems by the Rawlins RMP (Map 2-33b), a crossing of these corridors by a long-distance, north-south transmission line corridor is not explicitly excluded and may be impossible to avoid.

In addition, the southern extent of the easternmost route alternative of the Gateway South project would co-locate with the WY 789 corridor. The WY 789 corridor includes, at its south end within the CD-C project area, two topographical features known as Flat Top Mountain and The Bluffs. Although they are mostly of local interest to residents of Carbon and Sweetwater counties, these prominent features contribute to settings of moderate scenic quality, which is the highest level of scenic quality found within the CD-C project area (BLM 2011a). As prominent features, Flat Top Mountain and The Bluffs are focal points of foreground to middle ground views for travelers on WY 789 between Rawlins and Baggs, Wyoming. The western edge of the Sierra Madre portion of the CCSM wind-energy project is located 10 miles to the east of the CD-C project but there are locations in the eastern portions of the CD-C project area from which the wind-energy projects turbines may be visible.

The typical adverse impacts caused by a transmission line project are visual clutter in the foreground to middle ground of a view and the visibility of the tall towers, which are 140 to 190 feet high for high-voltage lines of this type. From many perspectives, tower structures would rise above the CD-C project area’s horizontal landforms and would likely appear prominently above the project area’s wide skylines, perhaps competing with prominent natural features. Since high-voltage transmission lines are industrial in character, introducing such facilities would alter the scenic quality of existing VRM Class III viewsheds that would be affected by the Gateway South or TransWest projects within the CD-C project area.

#### Cumulative impacts conclusion

The combination of the CD-C project and the development of the Gateway South, Gateway West, and TransWest transmission line right-of-way systems in the area south of I-80 and west of WY 789 could create a high cumulative impact in some viewsheds in the VRM Class III parts of the CD-C project area. In addition, development of oil and gas facilities throughout the CD-C project area may result in existing VRM Class III areas being exposed to site-specific visual impacts that have not been sufficiently mitigated.

## **5.12 RECREATION**

The CIAA for recreation is the Western ERMA of the RFO. The CIAA/ERMA covers all public land in the RFO west of Rawlins.

The recreation resources of the CIAA are those of the CD-C project area plus areas beyond the project area that include more of the same Hunt Areas, big game Herd Units, wild-horse management areas, contiguous blocks of public lands, and interconnected public roads. These combined resources support the recreation values of concern for the cumulative impacts analysis, namely big game hunting and dispersed, non-consumptive recreational uses that center on wild horses, other wildlife, and the character of the landscape.

Projects potentially affecting recreation in the CIAA are the CD-C project and other projects identified in **Table 5.0-1**. Other existing and reasonably foreseeable future projects are the Atlantic Rim Natural Gas Field Development, the Desolation Flats Natural Gas Development, the Luman Rim natural gas project and the Sierra Madre part of the CCSM. The transmission lines would be visible and would affect the landscape, and might reshape the recreation experience.

Cumulative impact to hunting, which is the main recreation activity in the CIAA, would occur as surface disturbance from development of the CD-C and other projects accumulates. Cumulative impact to hunting recreation begins with displacement of big game species within Hunt Areas because of disturbance to critical habitat and development activity within those habitats at key times of year. Cumulative impacts to hunting recreation also may include impacts to big game populations at the herd level of the primary big game targets in the CD-C project area, pronghorn and mule deer, because of long-term disturbance to sagebrush habitat.

When big game species leave a Hunt Area, hunters soon leave as well, because hunting success declines. If Herd Units are affected, the animals available for harvest and therefore the supply of hunting recreation, as reflected in the number of licenses issued, may decline. The potential for cumulative effects to Hunt Area displacement and potentially reduced availability from the herd is perhaps highest for pronghorn hunting. As indicated by **Table 3.8-1**, estimated populations in the largest pronghorn Herd Units of the CIAA (Red Desert Herd Unit north of I-80 and Bitter Creek Herd Unit south of I-80) had a slightly decreasing population trend from 2001 to 2009 and an estimated population lower than the objective in 2009. Mule deer also may be affected by cumulative, long-term disturbance of habitat.

There are also indirect impacts associated with hunting in the CIAA that may arise as development disturbance and activity accumulate. One is the potential for financial impact to big game outfitters whose commercial success depends on access to, and hunter success in, the CIAA. Another is potentially lower hunter safety because of higher accident risk as hunter density rises wherever displaced game has concentrated. Finally, some hunters wishing to avoid industrial facilities locations for safety and aesthetic reasons may find it more difficult to do so as development density rises in the CIAA; this would raise the likelihood of a lower-quality experience for some recreational hunters.

Relatively undisturbed scenery is an integral part of the recreation experience for activities such as wildlife viewing. Accumulating development would decrease the availability of this type of recreational setting throughout the CIAA, so recreationists seeking natural-appearing landscapes would have to travel elsewhere and perhaps for greater distances as the CD-C and other projects are fully developed over time and before landscapes are fully reclaimed.

The re-establishment of mature vegetation after final reclamation would take as much as 30 years in some parts of the CIAA. Localized areas may not achieve successful revegetation for much longer. With project lives of 45 to 55 years underway or reasonably foreseeable, the CIAA is not likely to be fully reclaimed for habitat or appearance for 70 to 80 years from its initial status. Long-term cumulative impacts in the CIAA would be likely to affect from two to four generations of hunters, wildlife viewers, and dispersed recreational users to the extent that they value solitude in a natural-appearing landscape.

Under Alternative E, No Action, the recreation resources of the CD-C project area would be the least impacted due to the smaller amount of surface disturbance anticipated.

### 5.13 LANDS WITH WILDERNESS CHARACTERISTICS

No Lands with Wilderness Characteristics have been identified within the CD-C project area.

## 5.14 CULTURAL AND HISTORICAL RESOURCES

The CIAA for cultural and historical resources is the CD-C project area. Archaeological sites generally are located in discrete areas and effects on these sites are a consequence of implementing surface-disturbing activities associated with a development proposal. Impacts from past and present actions within the project area could occur as a result of the following mineral development projects which overlap the CD-C project area: Continental Divide, CDWII, Creston/Blue Gap, and Patrick Draw. In addition to the Proposed Action, impacts from reasonably foreseeable future actions (**Table 5.0-1**) include three transmission lines: the TransWest Express, Gateway West, and Gateway South. The TransWest Express is proposed to run from Sinclair, Wyoming to southern Nevada. The proposed route would begin just south of I-80 and east of Rawlins, heading west-southwest into the project area, and turning south in Sweetwater County toward the Wyoming/Colorado border. In all, the proposed route would traverse approximately 45–50 miles within the project area. The Gateway West transmission line from Glenrock, WY to Idaho would bisect the project area from east to west, running to the south of and roughly paralleling I-80 until approximately 10 miles from the western boundary, where it would turn northwest across I-80, and then west toward Rock Springs. Approximately 72 miles of the route would lie within the project area. The Gateway South transmission line would originate at the Aeolous Substation between Medicine Bow and Hanna along the north bank of the Medicine Bow River, following the same route as Gateway West into the project area, and then splitting into multiple routes running south toward Nevada (**Map 5.0-1**). In all, approximately 140 miles of routes would cross the southern portion of the project area. The relatively limited amount of surface disturbance associated with these transmission lines and other small oil and gas projects relative to the CD-C project area, however, indicates that relatively few additional cultural sites would be affected.

Given the average site density of .03 cultural sites per acre (**Section 3.14.2**), approximately 1,314 sites could be located within accumulated disturbance areas for CD-C Alternative F (Agency Preferred Alternative). The other RFFAs that would create surface disturbance in the CIAA would add to that total.

In addition, segments of the Cherokee and Overland Trails, the Lincoln Highway/Union Pacific Grade, and the historic Rawlins-Baggs Road traverse the project area. These segments, including those that contribute to overall eligibility for listing on the NRHP, are summarized in **Table 5.14-1**.

**Table 5.14-1. Historic trails and roads in the CD-C project area**

Trail/Road	Total Miles, All Segments	Total Miles, NRHP- Contributing Segments
Overland Trail	22.49	14.08
Cherokee Trail	13.32	4.49
Lincoln Highway/UPRR Grade	45.24	16.24
Rawlins to Baggs Wagon Road	15.18	0.00

*Source: D. Johnson, Western Archaeological Services, personal communication; 2011.*

As directed by law, cultural resources inventories and consultations would be conducted for any projects involving federal, state, and private lands, and adverse effects to NRHP-eligible sites would be avoided, minimized, or mitigated as appropriate. All activities associated with the Proposed Action and the action alternatives would be in accordance with federal laws and agency guidelines. Impacts to any previously unknown NRHP-eligible sites that may be discovered during construction activities would be mitigated in accordance with this EIS. Although sites located within disturbance areas are avoided, minimized, or mitigated, sites located outside of and adjacent to disturbance areas are vulnerable to indirect impacts such as vandalism, illegal collection, dust, and erosion. It is anticipated that there would be a cumulative increase in vandalism, illegal collection, and dust due to the increase in roads throughout the entire natural



gas field, and increased erosion at sites located in the vicinity of well pads and associated pipelines where vegetation cover has been reduced or eliminated.

## 5.15 SOCIOECONOMICS

The CIAA for socioeconomic conditions includes Carbon and Sweetwater Counties, and communities located within these counties. Given Rock Springs' position as a regional service center for the natural gas industry in southwest Wyoming, the indirect effects of past, ongoing, and reasonably foreseeable future effects of regional natural gas development are also considered.

Within the project area, 283 new wells were drilled during 2010 and an estimated 3,938 wells were in production at the end of 2013. Production activities, maintenance and workover expenditures, employment, and tax revenue generation associated with these wells will be ongoing, regardless of which alternative is selected by the BLM. Because much of the infrastructure to support this level of drilling and production is in place, ongoing production activities, expenditures, and employment associated with wells currently in production are considered part of both the baseline and cumulative effects analyses.

Past and current natural gas drilling and production in the project area and elsewhere in the CIAA have resulted in the development of substantial infrastructure capable of supporting future development and production. In some cases this infrastructure has excess capacity relative to the current (mid-2011) levels of development. Examples of infrastructure put in place to support past and ongoing development include the natural gas operator and service company operations yards in Rock Springs, Wamsutter, Rawlins and Baggs, described in **Section 3.15.1.1**, as well as pipelines, service roads, and other ancillary facilities. Past and ongoing activities have also resulted in human resource development, such as a cadre of employees in natural gas drilling, production, and support companies. Finally, natural-resource and other industrial development has supported construction and operation of substantial commercial and public infrastructure in communities in the CIAA. This industrial, human, commercial, and public infrastructure is capable of supporting a certain level of ongoing and future natural resource and industrial development activity and serves as a base for expansion of capacities to support higher levels of development.

A number of the reasonably foreseeable projects identified in **Table 5.0-1** require regulatory approval to proceed. If approved, the projects could contribute to cumulative socioeconomic effects in specific areas of the CIAA. The potential for adverse cumulative effects such as labor force competition, housing shortages, and strained community infrastructure and services would occur primarily in the event of concurrent construction of these projects. The potential beneficial cumulative effects, including increases in tax revenues, would be longer-term.

In contrast, the reasonably foreseeable natural gas projects, both currently approved and as yet unapproved, would contribute to cumulative socioeconomic effects over longer time periods and would affect socioeconomic conditions in a broader portion of the CIAA.

Although each of the natural gas projects identified in **Table 5.0-1** has or will have an assumed pace of drilling and development identified in the relevant NEPA document, as noted in **Section 4.15.2**, the actual pace of natural gas development in southwest Wyoming is variable and unpredictable because development depends on a variety of factors including energy demand, pricing, regulatory approvals, rig and manpower availability, transmission pipeline capacity, weather, and the investment and development strategies of individual energy companies. Consequently, the potential for both beneficial and adverse cumulative socioeconomic effects would be greater during extended periods of elevated commodity prices and natural gas demand.

In the eastern portion of the CIAA, identified cumulative projects by 2020 include construction of the proposed CCSM, the Gateway West, Gateway South and TransWest Express transmission line projects,

the Lost Creek In-Situ Uranium Project, and the Medicine Bow Fuel & Power Coal-to-Liquids (CTL) Project.

The proposed CCSM Wind Project would primarily affect the Rawlins and Saratoga areas of the socioeconomic CIAA, although some construction workers might also seek housing in Rock Springs and the Wamsutter and Baggs areas. Due to timing stipulations related to wildlife, active construction would likely occur during a six-month period of three or four consecutive years, with 800 to 1,200 construction workers during the peak periods. Consequently, the potential for adverse temporary and short-term cumulative socioeconomic effects during construction would be high. Once construction is complete, cumulative socioeconomic effects would be largely beneficial.

Construction of the TransWest Express, Gateway West and Gateway South transmission line projects could each affect one or more communities in the region, depending on routing, as the construction workforce moves through the area over one or two construction seasons. The effects would again be associated with demand for housing, community services, and fiscal effects related to project activity and the construction workforces. Operating work-force requirements of the wind energy and transmission lines are substantially smaller than the construction workforce needs.

The Lost Creek In-Situ Uranium Project would affect Bairoil and Rawlins during construction and operation.

The Medicine Bow Fuel & Power CTL Project, a combination mining and industrial construction project, could create cumulative socioeconomic effects in Rawlins, Saratoga, and other communities in the Upper North Platte Valley in Carbon County, and in some Albany County communities located outside the CIAA during the multi-year construction phase and initial staffing period for project operations. Once full-scale operations begin and housing and public infrastructure and services are in place to serve demand, the socioeconomic effects would be largely beneficial.

The Jim Bridger and Black Butte mines primarily affect western Sweetwater County and the communities of Rock Springs and Green River and the Bridger Valley communities in Uinta County. The expansion of the Jim Bridger Mine is ongoing and most socioeconomic effects of the project were considered in the baseline.

The final construction schedules for the proposed wind energy, transmission line, mining and other projects listed in **Table 5.0-1** will not be known until they receive the required authorizations, approvals, and financing. It is also not possible to predict with accuracy the level of natural gas drilling that will occur in southwest Wyoming during the construction period for these projects.

If construction for all or some of these projects were to overlap concurrently with an increase in natural gas drilling levels to 2007–2008 levels, another “boom” could ensue in the CIAA. In that case, cumulative impacts on area socioeconomic conditions would include short-term and long-term positive effects on local economic conditions, increased employment opportunities and increased local and state government tax royalties.

Adverse effects would include demand for temporary and long-term housing resources that substantially exceed local supplies, demand for local government services that exceed some service capacities, and changes in local social conditions that could include social disruption in some communities. Increased employment opportunities in relatively high-paying construction and energy-development jobs would result in competition for workers to the detriment of existing businesses and government agencies that could lose existing employees and experience difficulty recruiting new employees. On the other hand, workers would benefit from the increased wages that would result from this competition, while simultaneously potentially facing higher costs of living.

Shortfalls in temporary housing availability could be mitigated by development of temporary housing facilities. Medicine Bow Fuel & Power has proposed such facilities to accommodate construction workers

on its CTL Project and the Power Company of Wyoming has indicated it would consider providing such facilities for CCSM. It is also becoming increasingly common for natural gas Operators and drilling companies to develop temporary housing; three such facilities, several rig camps, and the placement of dormitory units in local mobile-home parks were operational near the project area in 2007–2008.

The pace of residential construction in most communities in the CIAA would need to increase substantially to accommodate cumulative demand for longer-term housing units, were several of the projects listed in **Table 5.0-1** to overlap with an increase in natural gas development activities.

Demands on housing and local government services associated with some of the wind energy and transmission line projects and natural gas development would be seasonal, presenting staffing challenges for counties and communities. Excess capacity exists in many public-utility infrastructure systems (e.g., water and wastewater systems) in the communities that would likely host the bulk of the construction and natural gas development workforce. Recent experience in the CIAA has been that relatively few families and school-age children have accompanied construction and natural gas workers to the area; consequently, local school districts could likely accommodate cumulative enrollment with existing facilities in the near term. In the longer term some schools may need to add or expand facilities and the lead-time to secure approval and funding from the Wyoming School Facilities Commission and plan and construct school facilities could mean that certain facilities would experience crowding until new facilities are available.

Community services such as law enforcement, emergency response, social services, and road and bridge departments, which in some cases experienced reductions in funding levels, service provision, and staff cutbacks in recent years, could initially face constraints in responding to increased demand. For most projects, local receipts of sales and use tax revenues lag the increases in demand. In other cases, a jurisdictional mismatch could occur between jurisdictions benefitting from tax revenue accrual and those facing the demands. This lack of revenue, coupled with competition for workers and the difficulty in staffing for seasonal demand, would present substantial challenges for local governments in the early years of a boom.

When ad valorem and production-related revenues—and for wind energy projects, energy production tax revenues—begin to flow from the cumulative projects, counties and special districts (and in some instances, school districts) would benefit from substantially increased revenues. However, municipalities will not benefit directly from these revenues.

Cumulative development in the CIAA also holds potential to affect local attitudes, opinions, and lifestyles and these effects are likely to be mixed. Development of the wind energy, transmission line, mining, and other projects listed in **Table 5.0-1**, coupled with a moderate increase in natural gas development, would result in economic growth and increased employment opportunities in relatively high-paying jobs. These changes would create the prospect for improved financial status of many residents, which would correspondingly increase support for cumulative development activities, particularly among those segments of the community that would benefit directly or indirectly from the increased economic activity. On the other hand, dissatisfaction may occur among those residents whose economic activities and/or recreation activities rely on use of the same geographical areas as the Proposed Action and projects listed in **Table 5.0-1**, including ranchers, grazing operators, outfitters, hunters, and other recreationists. Moreover, if area residents perceive that wildlife habitat, scenic vistas, and other resources are being degraded by development, levels of dissatisfaction could become greater and more widespread.

Given the cyclical nature of natural gas development and the potential for other energy development to occur, it is difficult to predict development and associated population levels with any certainty. Following population gains in response to cumulative construction activities, population in the CIAA would likely decline as construction is completed, perhaps dramatically in the event of multiple concurrent construction schedules. Exceptions to this pattern would include the mining projects and the Medicine Bow Fuel & Power CTL project, which have relatively large operating workforce requirements. If

employment and population were to fall dramatically, businesses that expanded or opened to accommodate the temporary population influx would need to transition to accommodate the decreased demand. Some business closures would be likely. Effects on area housing conditions could range from moderate to severe, depending on whether the construction and natural gas development demands were accommodated in temporary housing or if housing to accommodate the temporary workforce was developed with a post-boom use in mind. In those cases, communities in the CIAA could reduce the amount of unoccupied temporary housing after construction is completed or if a slowdown in natural gas development were to occur. Similarly, the fact that most community infrastructure including water and sewer systems is already in place should help communities avoid substantial debt that would be difficult to service when population levels decrease.

## 5.16 TRANSPORTATION AND ACCESS

The CIAA for transportation includes western Carbon County, eastern Sweetwater County, and the highway transportation network providing access to and within the project area. Cumulative effects on transportation would include changes in traffic volumes. These changes, when combined with traffic associated with the CD-C project, would affect overall travel conditions on the CIAA transportation network. Past, ongoing, and reasonably foreseeable activities expected to produce incremental and cumulative impacts within the CIAA are summarized in **Table 5.0-1**.

Historic and ongoing traffic within the project area is associated primarily with natural gas drilling and production, grazing, and outdoor recreation. Within the project area, 283 new wells were drilled during 2010 and an estimated 3,938 wells were in production at the end of 2013. Production-related traffic associated with these wells will continue for their remaining productive life and during abandonment and reclamation, regardless of which alternative is selected by the BLM. Using the trip-generation factors developed for this assessment, an estimated 726 AADT would be associated with drilling under the Proposed Action in the peak year and an estimated 798 AADT associated with production activities in the peak year.

The reasonably foreseeable actions that could result in cumulative transportation impacts within the project area would be the previously authorized Desolation Flats and Luman Rim natural gas projects, and the TWE and Gateway South transmission line construction projects

Two county roads serving the project area also provide access to the Desolation Flats project area (DFPA): SCR 23/CCR 701 (Wamsutter–Dad Road) and CCR 700. Although these two roads have served development in both the project area and the DFPA for years, incremental increases in traffic on these roads could occur if natural gas demand and prices support an acceleration of drilling and field-development activities.

Cumulative effects on county roads associated with the Luman Rim project are not anticipated. Primary access to the Luman Rim project area (LRPA) from I-80 is via SCR 21, which is outside the project area. It is possible to access the LRPA via two roads that traverse the CD-C project area; SCR 67 travels north from I-80 and intersects with SCR 20, which then exits the project area to the west and intersects with SCR 21 south of the LRPA. However, the longer travel distance from I-80 associated with this route discourages its use to access the LRPA for all but contractors and vendors who may be traveling to/from the LRPA from other job worksites within the CD-C project area.

The eastern Gateway South transmission line corridor alternative that traverses the CD-C project area (see **Figure 5.0-1**) would primarily affect WY 789; the western corridor alternative would affect SCR 23S/CCR 701 (Wamsutter/Dad Road) and a series of BLM roads providing access to the west of the Wamsutter/Dad Road (3310, 3336, 3315, 3316, and 3317). The TransWest Express Transmission Line Route alternative that crosses the CD-C project area would similarly affect WY 789, the Wamsutter/Dad Road, and the same BLM roads as the western Gateway South alternative, and also could affect BLM

Road 3323. Under any of these three alternatives, the transmission line construction traffic would likely add to congestion and maintenance requirements on county and BLM roads.

All of the projects listed in **Table 5.0-1** could generate traffic increases on I-80, particularly during construction, although some of the affected sections of I-80 would be outside of the CIAA. Under an accelerated drilling scenario, periods of traffic impedance and congestion could be anticipated, and some increases in the number of accidents could be anticipated. Cumulative traffic effects could also increase road maintenance requirements for WYDOT and for both county road and bridge departments.

The highest volume of incremental traffic on I-80 would likely be in conjunction with the CCSM Wind Energy project, proposed for development south of Rawlins, and the Gateway South and TransWest Express transmission lines proposed for development west of Rawlins. Materials, equipment, and supplies deliveries for the CCSM project are anticipated to arrive by rail and be offloaded at an intermodal facility located either southeast of Sinclair or on the south side of I-80 west of Sinclair, which would result in relatively little cumulative truck traffic on I-80. However, daily commuting by workers and others, including trips by contractors, would result in an incremental increase in traffic on I-80. One option under consideration by the Power Company of Wyoming includes housing construction workers in Rock Springs and Laramie. Workers commuting from/to these communities to the CCSM project area would contribute to cumulative traffic effects on I-80 between Rock Springs and Rawlins or east of Rawlins for six to eight months during each of the anticipated four-year construction periods. These effects would be minimal given the substantial baseline volumes of traffic on I-80 in these locations.

The Medicine Bow Fuel & Power CTL Project would be located some distance from the project area. The TransWest Express and Gateway South transmission line corridors pass through the project area, and some substations and ancillary facilities may also be located within the project area. Construction equipment, supplies, and materials for these projects could be transported by rail or, for the CTL project and some segments of the transmission projects, via US 30 from Laramie. Transport of materials, equipment, and supplies to these projects would also occur on I-80 and, when considered in conjunction with the forecast traffic for CD-C, would generate cumulative traffic increases on the highway. Large increases would occur primarily during construction of these projects and would therefore be temporary and short-term in nature.

Construction and operations of the Lost Creek In-Situ Uranium Project could contribute to cumulative traffic impacts along I-80, although materials coming from the north—e.g., from Casper—would likely access the Lost Creek project via US 287. Construction and operations materials coming from the east or west on I-80 would travel through Rawlins to access US 287, and a portion of the project's construction and operations workforce would likely reside in Rawlins. Both of these scenarios would result in cumulative transportation effects within the city if the Lost Creek project's construction schedules were to coincide with natural gas development within the CD-C project area. Given the relatively minor increases in CD-C-related traffic anticipated for US 287, no substantial adverse cumulative impacts are anticipated.

Development associated with the previously approved Atlantic Rim Natural Gas Field Development Project would also use WY 789 to access the western portions of its project area. Cumulative transportation impacts would be anticipated for WY 789 between Creston Junction and Baggs, particularly during periods when market conditions promote higher levels of new development activity in the Atlantic Rim and CD-C project areas. Under an accelerated drilling scenario, periods of traffic impedance and congestion could be anticipated, particularly around the Dad area.

All of the natural gas projects listed in **Table 5.0-1** would generate additional traffic on I-80. If there were a regional acceleration of drilling and development in response to sustained high sales prices for natural gas, those increases could be substantial.

### 5.17 NOISE

The CIAA for the discussion of Noise is limited to the CD-C project area due to the localized nature of this issue. Noise will continue to be generated by project area operations for the life of the field.

Cumulative impacts of the Proposed Action and the alternatives include the addition of development- and production-related noise sources to those that already exist within the project area. Existing noise sources include, but are not limited to the I-80 corridor, Wyoming Highway 789, and other internal traffic routes, the railroad, gas compression facilities, fluid transport by truck, gas-stabilization equipment, hydrocarbon production, and maintenance activities. Potential new sources include those associated with construction of electric transmission lines that may cross through the project area. In some parts of the project area, the density of development could be considered by some individuals to be “noisy.” This continual (though likely low-level) noise may be disruptive or objectionable to individuals such as recreationists or livestock operators and may result in displacement of such activities.

## ■ MANAGEMENT ENVIRONMENT

### 5.18 RANGE RESOURCES

The CIAA for range management includes the entire area of all of the allotments that are located within or partially within the CD-C project area. The number of well pads projected for the alternatives varies from a high of 6,126 under the Proposed Action to a low of 2,783 under Alternative E (No Action). Many of the allotments in the southern portion of the CD-C project area cross the project boundary into other natural gas developments (Atlantic Rim on the east and Desolation Flats on the west). One allotment managed by the Rock Springs Field Office has minimal acreage within the CD-C project area, as well as acreage in the Luman Rim natural gas project.

Those allotments that cross into the other project areas would have impacts from both natural gas projects including forage loss, reduced palatability of forage from dust, potential damage to fences and other improvements, possible increase in invasive plant species that can out-compete native vegetation and poison sheep, possible collisions, and increased difficulty in management of stock (gates left open, etc.).

Depending on the location of well pads and the number of locations and associated facilities, some of the allotments may reach the level of significance for loss of AUMs described in **Section 4.18.2**. Surface-disturbance totals described in **Table 3.18-2** would likely be higher for allotments that are affected by developments in addition to the CD-C project. It is possible that in these allotments, the combination of impacts from several projects could result in the loss of AUMs that may reach the level of significance.

Construction of the three transmission lines planned to cross the CD-C project area and development of adjacent oil and gas fields may cause many of the same indirect impacts identified above and would increase overall impacts on the affected allotments.

### 5.19 OIL AND GAS AND OTHER MINERALS

The CIAA for oil and gas and other minerals is southwestern Wyoming. The natural gas fields of the CD-C project area make up the largest single source of oil and gas in the analysis area. The Atlantic Rim, Desolation Flats, Luman Rim, Table Rock, Moxa Arch, and Hiawatha natural gas projects are among the many other sites of fluid mineral development in the analysis area. The analysis area is an important natural gas-producing region and, together with natural gas from the CD-C project, production from projects in the area would substantially contribute to satisfying the demand of national markets.

Other minerals found in the CIAA are uranium, coal, and surface mineral materials. The Jim Bridger and Black Butte Coal Mines are the largest producers of coal in the CIAA. The Lost Creek In-Situ Uranium Project is located just north of the CD-C project area. The coal and uranium resources of the CIAA are not expected to be affected by the CD-C project or any of the other fluid mineral projects. The CD-C and other energy projects in the CIAA would provide additional demand for construction-grade mineral materials such as sand, stone, gravel, pumice, pumicite, clay, and rock. The total quantities required are not known.

### 5.20 HEALTH AND SAFETY

The CIAA for the discussion of Health and Safety includes the area for all RFFAs listed in **Table 5.0-1**. Two aspects of safety—increased traffic and additional natural gas pipeline construction—are common to all oil and gas activities across southern Wyoming. These oil and gas-related issues are long-term in duration and would continue as part of project area operations for the life of the field and beyond.

Cumulative impacts of the Proposed Action would include the addition of vehicles associated with natural gas development and the other reasonably foreseeable activities, including wind energy projects and

transmission line construction, to the interstate highway and local road systems. The additive number of semi-truck rigs and passenger vehicles would add to the risk of collision for the project workforce as well as the general public. I-80 would continue to be a major east/west transportation corridor for all aspects of transportation including materials needed for continued energy project development and operations, as well as transportation of materials from the field including produced condensate, produced water, and solid wastes; refer to **Section 5.16 Transportation and Access** for this discussion.

Natural gas pipelines may be constructed or enlarged to accommodate the volume of gas being produced across the southern tier of Wyoming. Conversely, as fields are depleted, gas production declines and pipelines may be abandoned.

## **5.21 WASTE AND HAZARDOUS MATERIALS MANAGEMENT**

The cumulative impacts analysis area for the discussion of Waste and Hazardous Materials Management includes the area for all RFFAs listed in **Table 5.0-1**. Wastes would continue to be generated and hazardous materials would continue to be used in the project area operations for approximately 45 to 55 years, the anticipated life of the field.

Cumulative impacts of the Proposed Action include wastes generated from 15 years of operating man camps, drilling and completion of 8,950 additional wells, and the associated produced water in addition to the wastes of the other RFFAs. Over its lifetime the project would add substantially to the volume of solid waste, drilling and completion operations wastes, and produced water, as well as to the wastes generated from well-site and pipeline compression and liquids stabilization facilities. The need to appropriately dispose of these wastes would stress the existing permitted capacity of local municipal and third-party disposal facilities and would necessitate the permitting and construction of additional disposal facilities in the CIAA. The cumulative impacts would be similar for all the analyzed alternatives, although at a reduced level for the No Action alternative.